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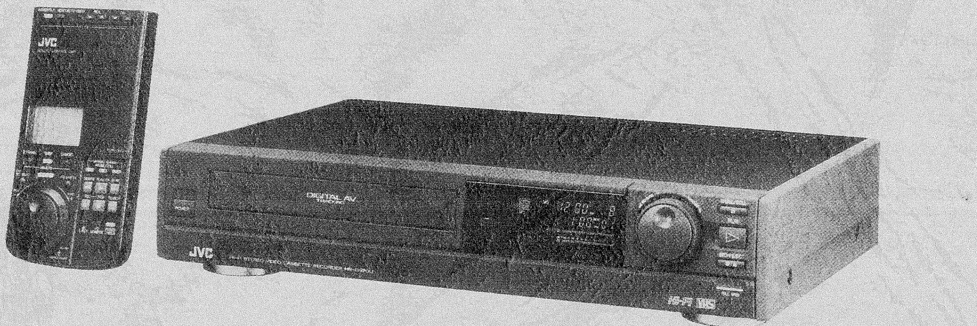
JVC

SERVICE MANUAL

Hi-Fi STEREO VIDEO CASSETTE RECORDER

HR-D960U/HR-D970U



SPECIFICATIONS (The specifications shown pertain specifically to the model HR-D970U)

GENERAL

Power requirement	AC 120 V∼, 60 Hz
Power consumption	23W
Temperature	
Operating	5°C to 40°C (41°F to 104°F)
Storage	– 20°C to 60°C (– 4°F to 140°F)
Humidity	
Operating	35% to 80%
Storage	5% to 80%
Operating position	Horizontal only
Dimensions (WxHxD)	449 x 94 x 338 mm (17-11/16" x 3-3/4" x 13-5/16")
Weight	5.7 kg (12.6 lbs)
Format	VHS NTSC standard
Tape width	12.65 mm
Tape speed (SP)	33.35 mm/sec (1-5/16 ips)
(EP)	11.12 mm/sec (7/16 ips)
Maximum recording time (SP)	160 min. with T-160 video cassette
(EP)	480 min. with T-160 video cassette

VIDEO

Signal system	NTSC-type color signal and EIA monochrome signal, 525 lines/60 fields
Recording system	Rotary two-head helical scan system with slant double-azimuth combination video heads
Input	0.5 to 2.0 Vp-p, 75 ohms, unbalanced
Output	1.0 Vp-p, 75 ohms, unbalanced
Signal-to-noise ratio	45 dB (Rohde & Schwarz noise meter) with PICTURE SHARPNESS control at center position
Horizontal resolution	240 lines

AUDIO

Input	– 8 dBs, more than 50 k-ohms, unbalanced
Output	– 6 dBs, less than 1 k-ohm, unbalanced (100 k-ohms, load)

NORMAL AUDIO

Recording system	Longitudinal track
No. of audio channels	1 normal audio channel
Frequency response	70 Hz to 10,000 Hz

Hi-Fi AUDIO

Recording system	Deep-layer recording system conforming to stereo Hi-Fi VHS standard
No. of audio channels	2 Hi-Fi audio channels
Frequency response	20 Hz to 20,000 Hz
Dynamic range	More than 90 dB
Wow and flutter	Less than 0.005% WRMS

TUNER

Tuning system	Frequency synthesized tuner
Channel coverage	
(VHF)	Channels 2 – 13
(UHF)	Channels 14 – 69
(CATV)	113 Channels
RF output	Channel 3, 4 or OFF (switchable; preset to Channel 3 when shipped) 75 ohms, unbalanced

TIMER

Clock reference	Quartz-crystal
Program capacity	1-month programmable timer/8-programs
Memory backup time	60 sec.

ACCESSORIES

Provided accessories	Antenna cable (F-type), Matching transformer, Infrared remote control unit, "AA" battery x 4, Audio cable, Video cable

E. & O.E. Specifications shown are for SP mode unless otherwise specified.
Design and specifications subject to change without notice.

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No. 82191
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NOTE: For a technical description, please refer to Technical Guide VTG82058 HR-D960/D970 NTSC.

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The following table lists the differing points between Models [suffixed HR-D960U, HR-D970U and HR-D970U(C)]

MODEL ITEM	D960U	D970U	D970U(C)
PACKING CASE	PQ33184-28	PQ33184-26	PQ33184-29
INSTRUCTIONS	PU30425-1159	PU30425-1157	PU30425-1160
TOLL FREE CARD	BT-20046E	←	
WARRANTY CARD	BT-20062B	←	BT-20025K
BATTERY	X2	X4	←
FRONT PANEL	PQ10874K-15	PQ10874J-15	PQ10874J-13
INDE PANEL		PQ10921A(L) PQ10922A(R)	←
REMOTE CONTROL	PQ10956A	PQ10842K-10	←

Important Safety Precautions

Prior to shipment from the factory, JVC products are strictly inspected to conform with the recognized product safety and electrical codes of the countries in which they are to be sold. However, in order to maintain such compliance, it is equally important to implement the following precautions when a set is being serviced.

● Precautions during Servicing

1. Locations requiring special caution are denoted by labels and inscriptions on the cabinet, chassis and certain parts of the product. When performing service, be sure to read and comply with these and other cautionary notices appearing in the operation and service manuals.
2. Parts identified by the ⚠ symbol and shaded (▨) parts are critical for safety.
   Replace only with specified part numbers.
   Note: Parts in this category also include those specified to comply with X-ray emission standards for products using cathode ray tubes and those specified for compliance with various regulations regarding spurious radiation emission.
3. Fuse replacement caution notice.
   Caution for continued protection against fire hazard.
   Replace only with same type and rated fuse(s) as specified.
4. Use specified internal wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads
5. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulation Tape
   2) PVC tubing
   3) Spacers
   4) Insulation sheets for transistors
   5) Barrier
6. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.) wrap ends of wires securely about the terminals before soldering.

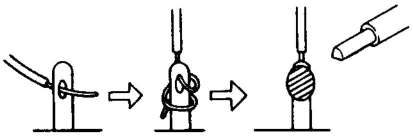


Fig. 1

7. Observe that wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.)
8. Check that replaced wires do not contact sharp edged or pointed parts.
9. When a power cord has been replaced, check that 10–15 kg of force in any direction will not loosen it.

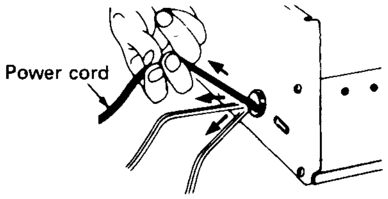


Fig. 2

10. Also check areas surrounding repaired locations.
11. Products using cathode ray tubes (CRTs)
    In regard to such products, the cathode ray tubes themselves, the high voltage circuits, and related circuits are specified for compliance with recognized codes pertaining to X-ray emission. Consequently, when servicing these products, replace the cathode ray tubes and other parts with only the specified parts. Under no circumstances attempt to modify these circuits. Unauthorized modification can increase the high voltage value and cause X-ray emission from the cathode ray tube.
12. Crimp type wire connector
    In such cases as when replacing the power transformer in sets where the connections between the power cord and power transformer primary lead wires are performed using crimp type connectors, if replacing the connectors is unavoidable, in order to prevent safety hazards, perform carefully and precisely according to the following steps.
    1) **Connector part number** : E03830-001
    2) **Required tool** : Connector crimping tool of the proper type which will not damage insulated parts.
    3) **Replacement procedure**
       (1) Remove the old connector by cutting the wires at a point close to the connector.
       Important : Do not reuse a connector (discard it).

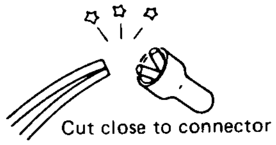


Fig. 3

(2) Strip about 15 mm of the insulation from the ends of the wires. If the wires are stranded, twist the strands to avoid frayed conductors.

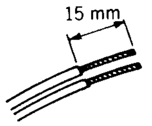


Fig. 4

(3) Align the lengths of the wires to be connected. Insert the wires fully into the connector.

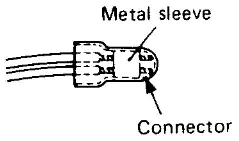


Fig. 5

(4) As shown in Fig. 6, use the crimping tool to crimp the metal sleeve at the center position. Be sure to crimp fully to the complete closure of the tool.

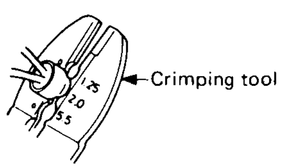


Fig. 6

(5) Check the four points noted in Fig. 7.

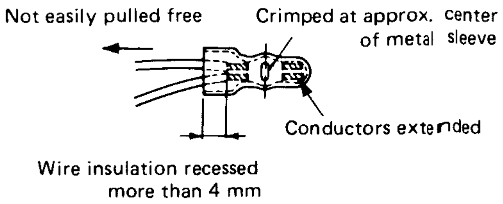

Not easily pulled free
Crimped at approx. center of metal sleeve
Conductors extended
Wire insulation recessed more than 4 mm

Fig. 7

Safety Check after Servicing

Examine the area surrounding the repaired location for damage or deterioration. Observe that screws, parts and wires have been returned to original positions, Afterwards, perform the following tests and confirm the specified values in order to verify compliance with safety standards.

1. **Insulation resistance test**
   Confirm the specified insulation resistance or greater between power cord plug prongs and externally exposed parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table 1 below.

2. **Dielectric strength test**
   Confirm specified dielectric strength or greater between power cord plug prongs and exposed accessible parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table 1 below.

3. **Clearance distance**
   When replacing primary circuit components, confirm specified clearance distance (d), (d') between soldered terminals, and between terminals and surrounding metallic parts. See table 1 below.

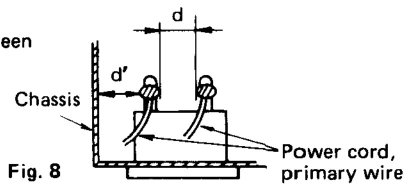


Fig. 8

4. **Leakage current test**
   Confirm specified or lower leakage current between earth ground/power cord plug prongs and externally exposed accessible parts (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.).
   Measuring Method: (Power ON)
   Insert load Z between earth ground/power cord plug prongs and externally exposed accessible parts. Use an AC voltmeter to measure across both terminals of load Z. See figure 9 and following table 2.

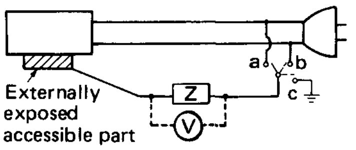


Fig. 9

5. **Grounding (Class I model only)**
   Confirm specified or lower grounding impedance between earth pin in AC inlet and externally exposed accessible parts (Video in, Video out, Audio in, Audio out or Fixing screw etc.).
   Measuring Method:
   Connect milli ohm meter between earth pin in AC inlet and exposed accessible parts. See figure 10 and grounding specifications.

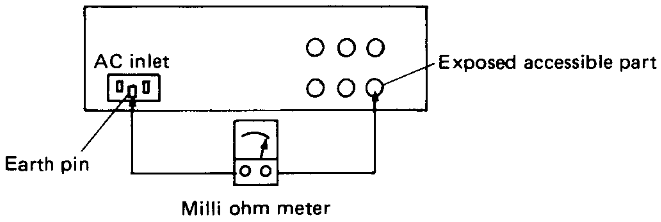


Fig. 10

Grounding Specifications

Region	Grounding Impedance (Z)
USA & Canada	Z ≦ 0.1 ohm
Europe & Australia	Z ≦ 0.5 ohm

AC Line Voltage	Region	Insulation Resistance (R)	Dielectric Strength	Clearance Distance (d), (d')
100 V	Japan	R ≧ 1 MΩ/500 V DC	AC 1 kV 1 minute	d, d' ≧ 3 mm
100 to 240 V			AC 1.5 kV 1 minute	d, d' ≧ 4 mm
110 to 130 V	USA & Canada	–	AC 900 V 1 minute	d, d' ≧ 3.2 mm
110 to 130 V 200 to 240 V	Europe & Australia	R ≧ 10 MΩ /500 V DC	AC 3 kV 1 minute (Class II) AC 1.5 kV 1 minute (Class I)	d ≧ 4 mm d' ≧ 8 mm (Power cord) d' ≧ 6 mm (Primary wire)

Table 1 Specifications for each region

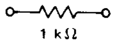
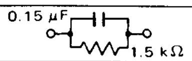
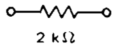
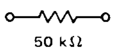
AC Line Voltage	Region	Load Z	Leakage Current (i)	a, b, c
100 V	Japan	 1 kΩ	i ≦ 1 mA rms	Exposed accessible parts
110 to 130 V	USA & Canada	 0.15 μF 1.5 kΩ	i ≦ 0.5 mA rms	Exposed accessible parts
110 to 130 V 220 to 240 V	Europe & Australia	 2 kΩ	i ≦ 0.7 mA peak i ≦ 2 mA dc	Antenna earth terminals
		 50 kΩ	i ≦ 0.7 mA peak i ≦ 2 mA dc	Other terminals

Table 2 Leakage current specifications for each region

Note: These tables are unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

INSTRUCTIONS

SAFETY PRECAUTIONS

CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER-SERVICEABLE PARTS INSIDE.
REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

Note to CATV system installer:
This reminder is provided to call the CATV system installer's attention to Article 820-40 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close to the point of cable entry as practical.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

This video cassette recorder should be used with AC 120V∿, 60 Hz only.
CAUTION:
To prevent electric shocks and fire hazards, do NOT use any other power source.

- Cassettes marked "VHS" (or "S-VHS") can be used with this video cassette recorder.
- HQ VHS is compatible with existing VHS equipment.

CAUTION
TO PREVENT ELECTRIC SHOCK DO NOT USE THIS POLARIZED PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

ATTENTION:
Pour prévenir l'électrocution, ne pas utiliser cette fiche polarisée avec un prolongateur, une prise de courant ou une autre sortie de courant, sauf si les lames peuvent être insérées à fond sans en laisser aucune partie à découvert.

NOTE: The rating plate and the safety caution are on the rear and side of the unit.

CAUTION — Changes or modifications not approved by JVC could void user's authority to operate the equipment.

When you are not using the video recorder for a long period of time, it is recommended that you disconnect the power cord from the AC outlet.

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A Consumer Video Products Safety Guide

Electrical energy can perform many useful functions. But improper use can result in potential electrical shock or fire hazards. This unit has been engineered and manufactured to assure your personal safety. In order not to defeat the built-in safeguards, observe the following basic rules for its installation, use and servicing.

ATTENTION:

Follow and obey all warnings and instructions marked on your video product and its operating instructions. For your safety, please read all the safety and operating instructions before you operate this unit and keep this operating instruction manual for future reference.

INSTALLATION

1. Grounding or Polarization

(A) Your video product may be equipped with a polarized alternating-current line plug (a plug having one blade wider than the other). This plug will fit into the power outlet only one way. This is a safety feature.

If you are unable to insert the plug fully into the outlet, try reversing the plug. If the plug should still fail to fit, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the polarized plug.

(B) Your video product may be equipped with a 3-wire grounding-type plug, a plug having a third (grounding) pin. This plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the safety purpose of the grounding-type plug.

2. Power Sources

Operate your unit only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your home, consult your appliance dealer or local power company. If your unit is intended to operate from battery power, or other sources, refer to the operating instructions.

3. Overloading

Overloaded power outlets and extension cords are dangerous; so are frayed cords and broken plugs. Any of these may result in a shock or fire hazard. Call your service technician for replacement of such cords and plugs. Extension cords or adaptors that defeat the safety purpose of polarized or 3-wire grounding-type plug power cords should not be used.

4. Power Cord Protection

Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

5. Ventilation

Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the unit and to protect it from overheating, these openings must not be blocked or covered.

- Do not block the openings by placing the unit on a bed, sofa, rug or other similar surface.
- Do not place the unit near or over a radiator or heat register.
- Do not place the unit in a built-in installation such as a bookcase or rack unless proper ventilation is provided or the manufacturer's instructions have been adhered to.

ANTENNA INSTALLATION INSTRUCTIONS

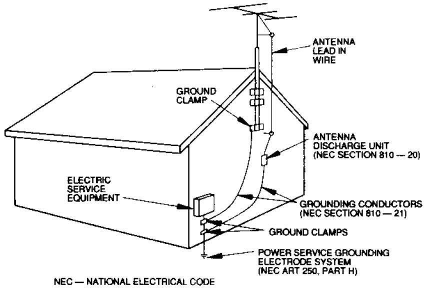
1. Outdoor Antenna Grounding

If an outside antenna or cable system is connected to the video recorder or tuner, be sure the antenna or cable system is grounded so as to provide some protection against voltage surges and built-up static charges. Section 810 of the National Electrical Code. ANSI/NFPA No. 70-1984, provides information with respect to proper grounding of the mast and supporting structure, grounding conductors, location of antenna discharge unit, connection to grounding electrodes and requirements for the grounding electrode.

2. Power Lines

To avoid the possibility of a fatal electrical shock, outdoor antennas and lead-in wires should be kept well away from overhead power lines or other electric light or power circuits, or from where they can fall onto such power lines or circuits. When installing an outside antenna system, extreme care should be taken to keep from touching such power lines or circuits as contact with them might be fatal.

EXAMPLE OF ANTENNA GROUND AS PER NATIONAL ELECTRICAL CODE


ANTENNA LEAD IN WIRE
GROUND CLAMP
ANTENNA DISCHARGE UNIT (NEC SECTION 810 — 20)
ELECTRIC SERVICE EQUIPMENT
GROUNDING CONDUCTORS (NEC SECTION 810 — 21)
GROUND CLAMPS
POWER SERVICE GROUNDING ELECTRODE SYSTEM (NEC ART 250, PART H)
NEC — NATIONAL ELECTRICAL CODE

S2898A

USE

1. Accessories

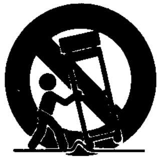
To avoid personal injury:

- Do not place this video product on an unstable cart, stand, tripod, bracket, or table. It may fall, causing serious injury to a child or adult, and serious damage to the appliance.
- Use only with a cart, stand, tripod, bracket, or table recommended by the manufacturer or sold with the video product.
- Use a mounting accessory recommended by the manufacturer and follow the manufacturer's instructions for any mounting of the appliance.
- Do not try to roll a cart with small casters across thresholds or deep-pile carpets.

1A.

An appliance and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the appliance and cart combination to overturn.

PORTABLE CART WARNING
(symbol provided by RETAC)



S3126A

2. Water and Moisture

Do not use this video product near water — for example, near a bath tub, wash bowl, kitchen sink or laundry tub, in a wet basement, or near a swimming pool and the like.

3. Object and Liquid Entry

Never push objects of any kind into this video product through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on this video product.

4. Attachments

Do not use attachments not recommended by the manufacturer of this video product as they may cause hazards.

5. Cleaning

Unplug this video product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

6. Lightning

For added protection for the video recorder or tuner during a lightning storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet and disconnect the antenna or cable system This will prevent damage to the video product due to lightning and power-line surges.

SERVICING

1. Servicing

If your video product is not operating correctly or exhibits a marked change in performance and you are unable to restore normal operation by following the detailed procedure in its operating instructions, do not attempt to service it yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.

2. Damage Requiring Service

Unplug the video product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

a. When the power supply cord or plug is damaged.
b. If liquid has been spilled, or objects have fallen into the video product.
c. If the video product has been exposed to rain or water.
d. If the video product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions as an improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the video product to its normal operation.
e. If the video product has been dropped or the cabinet has been damaged.
f. When the video product exhibits a distinct change in performance — this indicates a need for service.

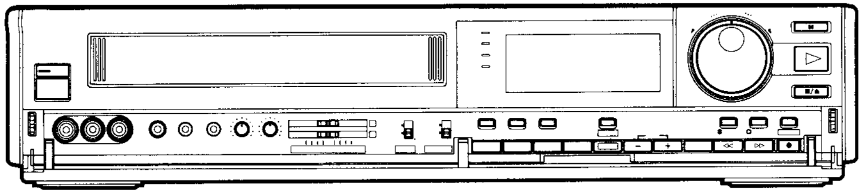
3. Replacement Parts

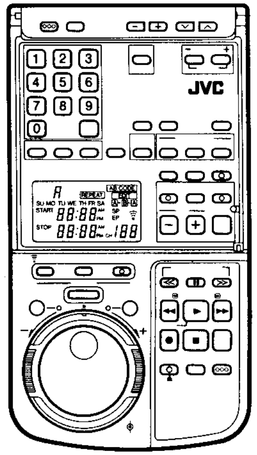
When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original part. Unauthorized substitutions may result in fire, electric shock or other hazards.

4. Safety Check

Upon completion of any service or repairs to this video product, ask the service technician to perform safety checks to determine that the video product is in safe operating condition.

FEATURES





VCR

- Hi-Fi VHS stereo sound with more than 90-dB dynamic range.
- Multi-purpose Jog/Shuttle control dials and full array of advanced editing functions including Preroll Assemble and Insert Editing.
- Quick-response full-loading mechanism minimizes waiting time; one second from Stop to Play.
- Digital AV Tracking for immediate automatic adjustment to optimum Hi-Fi audio and video tracking.
- 181–Channel frequency-synthesized cable-compatible tuner.
- Flexible timer programming options; 24-hour timer, one-month/8-event timer, and off-timer.
- DA-4 head system for high-quality pictures in both SP and EP modes including special-effects playback.

REMOTE CONTROL UNIT

- Compatible with most major brands of televisions for basic control functions.
- Independent timer programming with 4 program memories and built-in LCD screen.
- Multi-purpose Jog/Shuttle control dials.
- New color on-screen menu system facilitates timer programming, channel presetting, clock adjusting, or VCR status setting.
- Blank Search for locating the end of a recorded section with automatic display of remaining tape time.
- A complete array of Realtime and Index search functions.
- Fast- and slow-motion playback at various speeds in both directions.
- Duet Editing for simultaneous control of two JVC decks in editing.

Other major features

• White fader function for fade-in and fade-out effects in edits • Automatic repeat playback • Retake function • Skip Search • TV monitor • Automatic functions including Next-Function Memory • Picture sharpness control • Two sets of AV input connectors (front and rear) • Two sets of AV output connectors (rear) • Two preroll-capable PAUSE IN connectors (front and rear) • PAUSE OUT connector for synchronized preroll operation of another preroll-capable JVC deck when editing.

PRECAUTIONS

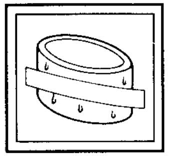
VCR

Handling and storage

- Avoid using the recorder under the following conditions:
  - — extremely hot, cold or humid places,
  - — dusty places,
  - — places subject to vibrations, and
  - — poorly ventilated places.
- Be careful of moisture condensation.
  Avoid using the recorder immediately after moving from a cold place to a warm place. The water vapor in warm air will condense on the still-cold video head drum and tape guides and may cause damage to the tape and the recorder.
- Handle the recorder carefully.
  - Do not block the ventilation openings.
  - Do not place anything heavy on the recorder.
  - Do not place anything which might spill and cause trouble on the top cover of the recorder.
  - Use in horizontal (flat) position only.
- In case of transportation,
  - Avoid violent shocks to the recorder during packing and transportation.
  - Before packing, be sure to remove the cassette from the recorder.

Moisture condensation

- If you pour a cold liquid into a glass, water vapor in the air will condense on the surface of the glass. This is called moisture condensation.
- Moisture condensation on the head drum, one of the most crucial parts of the video recorder, will cause damage to the tape.



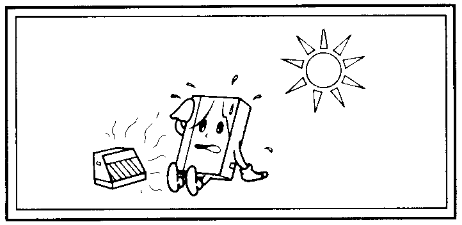
- Moisture in the air will condense on the recorder when you move it from a cold place to a warm place, or under extremely humid conditions.
- In conditions where moisture condensation may occur, keep the power cord plugged in an AC outlet and the power switched on; this would help prevent condensation from occurring. When condensation has occurred, it will not evaporate quickly once the power is switched on. Wait a few hours for the recorder to become dry.

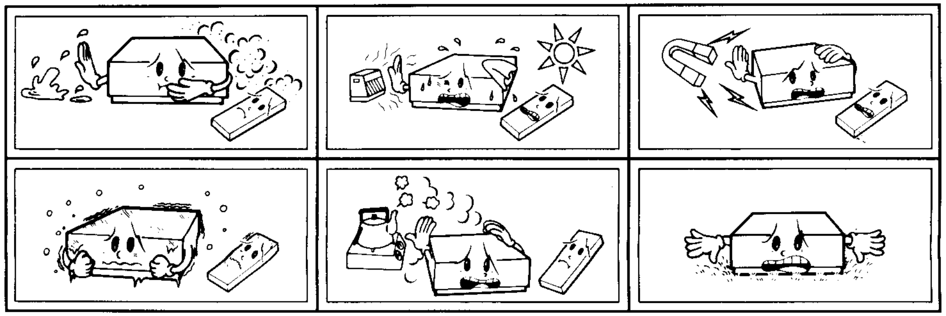
REMOTE CONTROL UNIT

- Avoid violent shocks, especially take care not to drop the unit.
- Take care not to allow liquid to spill into the unit or dampen the terminals.
- Do not place heavy objects on the unit.
- Avoid leaving the unit in places subject to direct sunlight or extremely high temperatures.

VIDEO CASSETTES

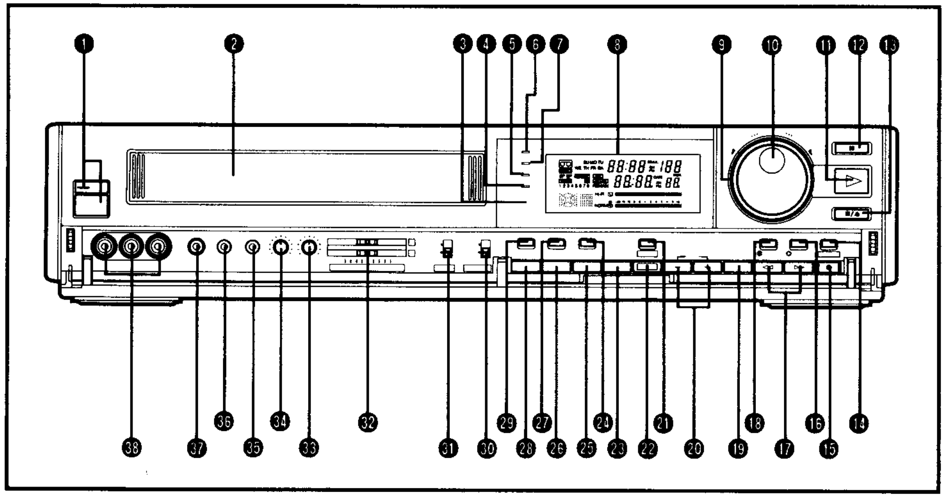
- Avoid exposing the cassettes to direct sunlight. Keep them away from heaters.
- Avoid extreme humidity, violent vibrations or shocks, strong magnetic fields (near a motor, transformer or magnet) and dusty places.
- Place the cassettes in cassette cases and position vertically.





CONTROLS, INDICATORS AND CONNECTORS

FRONT PANEL



① **POWER button with LED indicator**
Loading a cassette also turns on the power.

② **Cassette loading slot**

③ **Infrared beam receiving window**

④ **DIGITAL AV TRACKING indicator**
Lights in the Digital AV Tracking mode. Blinks while adjusting. (See page 26.)

⑤ **SAP REC indicator**
Lights when "2ND AUDIO" on the VCR SETUP menu is set for "ON".

⑥ **STEREO indicator**
Lights when a stereo program is being received.

⑦ **SAP indicator**
Lights when a TV program accompanied by a second audio program is being received.

⑧ **Display Panel**
See page 18.

⑨ **SHUTTLE ring (outer control)**
Use for variable speed search. (See page 27.)

⑩ **JOG dial (inner control)**
Use for jog search. (See page 27.)

⑪ **PLAY button**
- To play back a tape.
- To cancel the Pause/Still and Search mode and resume normal playback.
- To start recording from the Record-Pause mode.
- To start audio dubbing from the Audio Dub Standby mode.
- To start insert editing from the Insert Edit Standby mode.

⑫ **PAUSE/STILL button**
- To stop the tape temporarily to avoid recording unwanted material while in the Record mode.
- To view a still picture while in the Play mode.
- The still picture can be advanced each time this button is pressed.

⑬ **STOP/EJECT button**
- Press while in the Stop mode to eject the cassette.
- Press while in other modes to stop the tape.

⑭ **START button**
To engage the 24-Hour Instant Timer Set mode. (See page 33.)

⑮ **REC/ITR button**
- Press once to start recording.
- Press again for instant timer recording. (See page 34.)
- Also use to set the required recording time in the 24-Hour Instant Timer Set mode. (See page 33.)

⑯ **INSERT button**
To engage the Insert Standby mode. (See page 44.)

⑰ **REW/FF and Shuttle Search buttons**
- Press while in the Stop mode to rewind or fast-forward the tape.
- Press while in the Play mode for Shuttle Search in the reverse or forward direction.

⑱ **A. DUB button**
Press while in the Still mode, then press the Play button ⑪ to start audio dubbing. (See page 42.)

⑲ **SELECT button**
To verify entry and proceed to the next step during on-screen setting operations.

⑳ **SET/CHANNEL (∨/∧)/TRACKING/V.LOCK buttons (-/+)**
- To adjust data or move the cursor during on-screen setting operations.
- For up/down channel scan tuning. Obtain "AU" in the channel display section to engage the AUX mode.
- To correct tracking errors in the manual tracking mode.
- To eliminate vertical vibrations of the picture if observed in the Still mode.

㉑ **TIMER button**
To engage the Timer Standby mode.

㉒ **MENU button**
To call up the on-screen menu. (See page 21.)

㉓ **C. MEMORY/ADD/REPEAT button**
- To engage the Counter Memory mode. (See page 39.)
- To store additional channels during manual channel setting. These channels will then be tuned in during up/down scan tuning.
- To enter the repeat command in timer programming.

㉔ **VIDEO FADER button**
To fade the picture in or out. (See page 44.)

㉕ **C. RESET/SKIP/CANCEL button**
- To reset the Realtime Counter display to "0H 00M 00S".
- To remove unwanted channels during manual channel setting.
- To clear the preset timer data during timer programming.

㉖ **COUNTER/REMAIN/DATE button**
To switch the display panel between the counter, remaining tape time and date modes.

㉗ **SIMULCAST button**
To record FM simulcast broadcasts. (See page 31.)

㉘ **SP/EP button**
To select the recording speed (Standard Play or Extended Play).

㉙ **TV/VIDEO button**
TV mode for viewing broadcast TV programs. VIDEO mode for viewing tape programs via RF connection. If the RF output channel select switch ● on the rear panel is set to OFF, this button has no effect.

㉚ **AC ONLINE switch**

OFF position:	Power flows through the rear panel AC OUTLET ● regardless of whether the recorder is on or off.
ON position:	*Power flows only when the recorder is on.* When used in combination with the built-in timer, this enables timer-controlled power supply for the connected equipment.

㉛ **EDIT/PREROLL switch**
Normally set to OFF. During editing, set to ON. If this recorder is used as a source player, signals closer to the original will be output. If this recorder is used as an editing recorder, the preroll function will operate. (See pages 43 and 44.)

㉜ **Hi-Fi REC LEVEL controls**
To adjust the Hi-Fi audio recording level manually.

㉝ **PICTURE SHARPNESS control**
To obtain a softer or sharper playback picture.

㉞ **PHONES VOLUME control**
Adjusts the level of the audio output from the headphone jack ㉟.

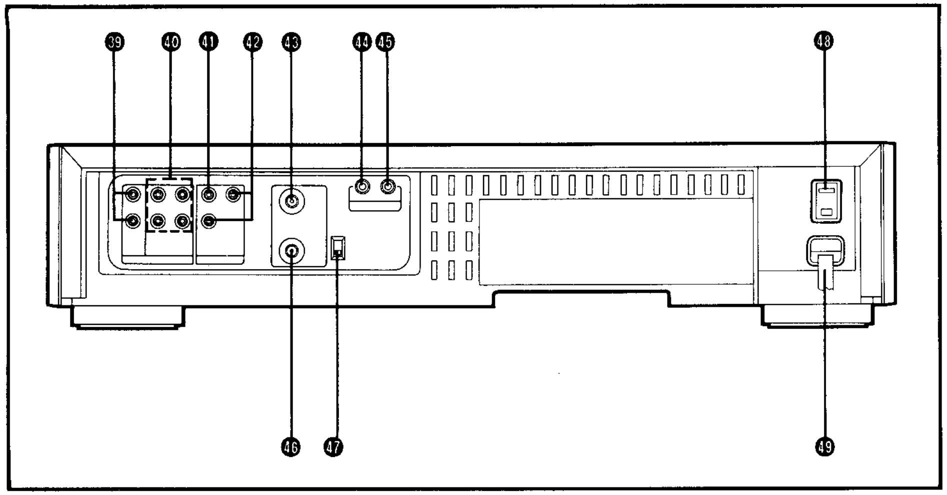
㉟ **PHONES jack**
Connect a set of headphones for monitoring or private listening.

㊱ **REMOTE PAUSE terminal**
- When editing from a JVC VideoMovie equipped with the Master Edit Control system, connect the remote control cable of the VideoMovie to this terminal to enable control of the tape with the VideoMovie's controls.
- When editing to a JVC video deck equipped with a PAUSE OUT terminal, connect that terminal to this terminal to enable synchronized preroll editing.

㊲ **MIC jack**
Connect a microphone for audio dubbing.

㊳ **LINE IN connectors**
A set of audio and video input connectors for recording from an external source.

REAR PANEL



㊴ **AUDIO IN connectors**
Connect to the AUDIO OUT connectors of another video recorder or the A/V OUT connector of a VideoMovie for tape-to-tape transfer.

㊵ **AUDIO OUT 1/2 connectors**
Two pairs of AUDIO OUT connectors allow simultaneous connection of a stereo television and an audio amplifier for playback.

㊶ **VIDEO IN connector**
Connect to the VIDEO OUT connector of another video recorder or the A/V OUT connector of a VideoMovie for tape-to-tape transfer.

㊷ **VIDEO OUT 1/2 connectors**
Two VIDEO OUT connectors allow simultaneous connection of an AV television and another video recorder for tape-to-tape transfer.

㊸ **ANT. IN terminal**
Connect an antenna cable or a cable TV line. If necessary, use the matching transformer (provided).

㊹ **REMOTE PAUSE IN terminal**
Same as ㉟ on the front panel. When connecting an external source to the rear panel connectors for editing, use this REMOTE PAUSE IN terminal.

㊺ **REMOTE PAUSE OUT terminal**
Connect the REMOTE PAUSE terminal of a second preroll-capable VCR for synchronized preroll editing.

㊻ **RF OUT terminal**
Connect to the all-channel antenna connector (female F) of your television using the provided antenna cable.

㊼ **RF output channel select switch**
See "VIDEO CHANNEL SETTING" on page 16.

㊽ **AC OUTLET**
Supplies power to external equipment requiring less than 300 W. Functions as a SWITCHED outlet when the AC ONLINE switch ㉚ is set to ON.

㊾ **Power cord**

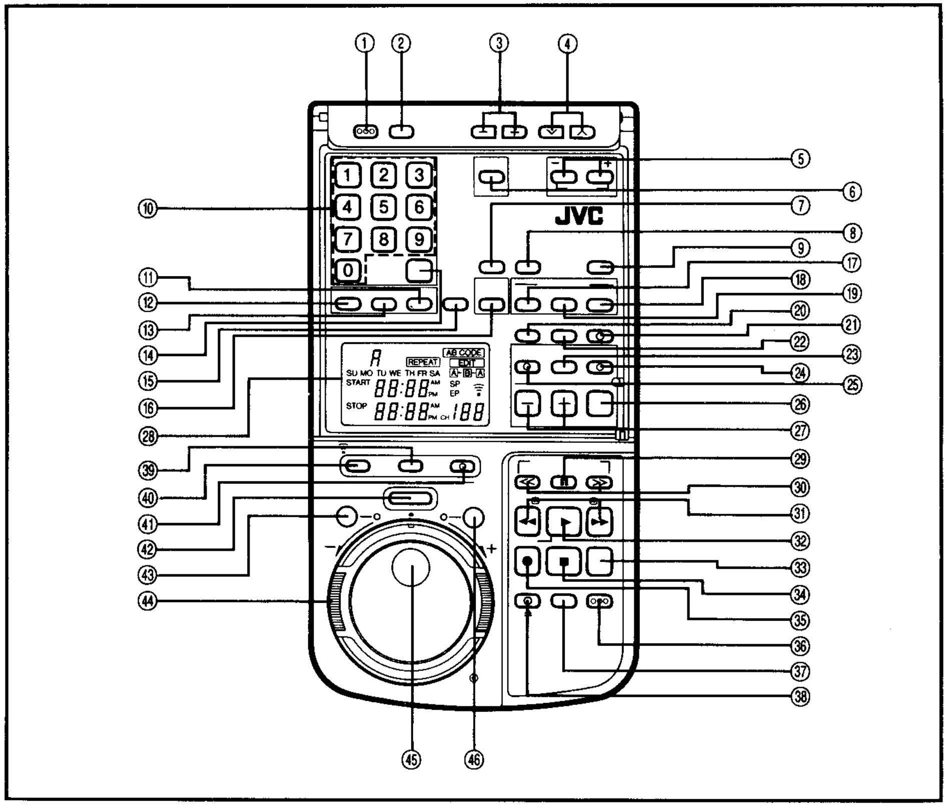
REMOTE CONTROL UNIT

FROM TAPE CONTROL TO TIMER PROGRAMMING

The provided remote control unit is capable of controlling most VCR functions.

In addition, this remote control is provided with an LCD screen for timer programming, and multi-purpose Jog/Shuttle control dials, as well as multi-brand-compatible TV control buttons. So, after loading a cassette, sit back and use your remote control. You do not have to refer to the VCR's display panel because all necessary indications appear on the TV screen.

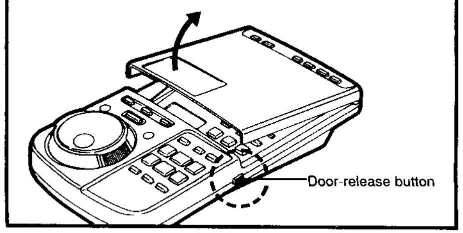
- The maximum operating distance of the remote control is about 8 m (26 ft).



PRECAUTIONS

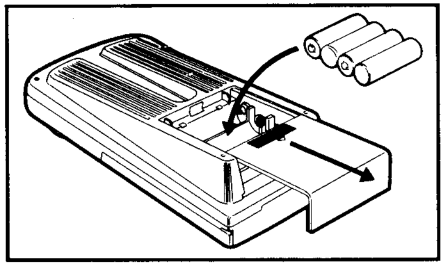
- Avoid violent shocks, especially take care not to drop the unit.
- Take care not to allow liquid to spill into the unit or dampen the terminals.
- Do not place heavy objects on the unit.
- Avoid leaving the unit in places subject to direct sunlight or extremely high temperatures.

Swing open the cover after pressing the button on the side.



INSTALLING THE BATTERIES

1. Slide the battery compartment cover on the rear of the unit in the direction of the arrow (▼).
2. Insert 4 "AA"-size batteries (provided) in the correct directions into the battery compartment.
3. Replace the cover.



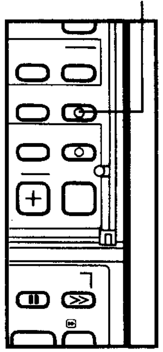
A/B CODE SWITCHING

When you own two JVC video decks, this remote control can operate both decks separately; they will not respond simultaneously to the remote control's signal, if they are set to respond to different codes. Initially this recorder is set in the "A" code mode. Therefore, if the A/B CODE button ㉑ is set for "B", this recorder will not respond to remote control commands. If you wish to change the recorder's code mode to "B", follow the instructions below:

(1) Unplug the power cord of the recorder from the AC outlet.
(2) Set the A/B CODE button for "B".
(3) Plug the power cord of the recorder into the AC outlet.
(4) Turn on the power of the recorder using the remote control's POWER (VIDEO) button ㊱.
The recorder "memorizes" this B code and will respond only to the B code signals. Set the other deck to respond to the A code signals in the same procedure.

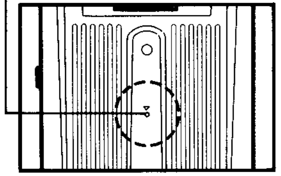
Note:
Do not operate other remote controls after you have plugged the recorder into the AC outlet and before you press the POWER (VIDEO) button.

CAUTION:
Some televisions may malfunction in response to the remote control when used in the "B" mode. If this should happen, switch the mode back to "A".



RESET button
Insert a pointed object into the hole to press the initialize button inside, when required.
The memory for the LCD display will be cleared.
Normally do not touch this button.

Rear of the remote control unit



CONTROL BUTTONS: WHEN TO USE

① **POWER (TV) button**
To turn the TV power on or off.

② **MONITOR (TV/VIDEO) button**
To select the TV's operating mode.
TV: For viewing broadcast programs or tape programs via RF connection.
VIDEO: For viewing programs via AV connection.

③ **VOL (–/+) buttons**
To decrease or increase the TV's sound volume.

④ **CHANNEL ∨/∧ buttons**
To select a desired channel on the TV receiver.

⑤ **TRACKING (–/+) buttons**
- To correct errors in the manual tracking mode.
- Press both buttons simultaneously to cancel the Auto Tracking mode, or to resume auto tracking from manual tracking.

⑥ **TV/VIDEO button**
Functions same as VCR's ●.

⑦ **TV CODE button**
To set the TV signal code for controlling the basic functions of TVs other than a JVC. (See page 14.)

⑧ **SP/EP select button**
Functions same as VCR's ●.

⑨ **AUDIO MONITOR button**
Selects the audio track(s) to be output: Hi-Fi, normal, or a mixture of the two. (See page 20.)

⑩ **Multi-Purpose Numeric Keys**
Ordinarily to select a desired channel. To change channels instantly, press the ENTER button immediately after pressing the numeric keys. "0" can be used for setting to the AUX mode.
TV code setting: See page 14.
On-screen menu: See pages 22 - 24 and 36.
Realtime Go-To: See page 39.
Index Search: See page 40.

⑪ **INDEX button**
To engage the Index Search mode. (See page 40.)

⑫ **MARK button**
While in the Record or Play mode, press to put an additional index code on the tape.

⑬ **ERASE button**
While in the Play mode, press to erase an unnecessary index code.

⑭ **ENTER/ADD button**
- To obtain a 5-second on-screen mode check display.
- To store a channel during manual channel setting.
- To instantly tune in the channel selected with 10-key input.

⑮ **INTRO button**
To engage the Intro Search mode. (See page 40.)

⑯ **GO-TO button**
To engage the Realtime Go-To mode. (See page 39.)

⑰ **DUET EDITING MODE button**
To engage the Duet Editing mode between two decks. (See page 45.)

⑱ **DUET EDITING START button**
To start editing between the two decks during Duet Editing.

⑲ **DUET EDITING STANDBY button**
To engage the player deck in the Still mode and the recorder deck in the Record mode during Duet Editing.

⑳ **DISPLAY button**
Functions same as VCR's ●.

㉑ **A/B CODE button**
To control two JVC video decks with a single remote control unit. (See page 11.)

㉒ **CLOCK ADJ button**
To adjust the LCD clock of the remote control.

㉓ **C. MEMORY/REPEAT button**
- To engage the Counter Memory mode. (See page 39.)
- To enter the repeat command in timer programming.

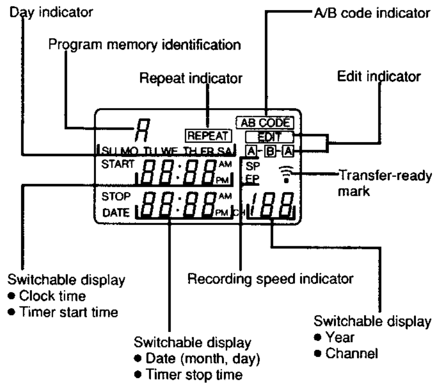
㉔ **C. RESET/CANCEL/SKIP button**
Functions same as VCR's ●.

㉕ **MENU button**
Functions same as VCR's ●. (See page 21.)

㉖ **SELECT button**
Functions same as VCR's ●.

㉗ **SET (–/+)/TIME SEARCH buttons**
- To adjust data or move the cursor during on-screen setting operations.
- When pressed after the GO-TO button has been pressed, these buttons function to specify the direction of tape movement.

㉘ **LCD (Liquid Crystal Display) screen**
Refer to this screen when programming the remote control's built-in timer memory. Normally functions as a clock.



㉙ **PAUSE/STILL button**
Functions same as VCR's ●.

㉚ **VARIABLE SEARCH buttons**
For slow motion and rapid search at variable speeds. (See page 27.)

㉛ **REW/FF and Shuttle Search buttons**
Function same as VCR's ⓱.

㉜ **PLAY button**
- To play back a tape.
- To cancel the Pause/Still and Search mode and resume normal playback.
- To start recording from the Record-Pause mode.

㉝ **SKIP/BLANK SEARCH button**
- Press while in the Play mode, to zip through unwanted tape segments. (See page 29.)
- Press in the Stop mode to engage the Blank Search mode. The tape will automatically stop at the beginning of a non-recorded section, and the remaining tape time will be automatically displayed in hours and minutes. (See page 32.)

㉞ **STOP button**
To stop the tape.

㉟ **REC button**
Press together with the PLAY button ㉜ to start recording.

㊱ **POWER (VIDEO) button**
To turn the recorder's power on or off.

㊲ **TV MONITOR button**
Press during tape playback to monitor the TV broadcast being received by the recorder's built-in tuner, or from a connected external video source (in the AUX mode).

㊳ **EJECT button**
To eject the cassette.

㊴ **TIMER button**
Functions same as VCR's ●.

㊵ **TRANS button**
Press to transfer the data held in the remote control's timer memory to the recorder. The clock data can also be transferred.

㊶ **MEMORY CANCEL button**
To cancel the programmed data in the remote control's timer memory.

㊷ **MEMORY PROG. button**
To program the remote control's timer memory. (See page 37.)

㊸ **CH/SET.SELECT button and indicator**
Press this button first when you are going to use the JOG/SHUTTLE controls for purposes other than searching. The indicator will light, and will automatically turn off after about one minute if the JOG/SHUTTLE controls are left unused.

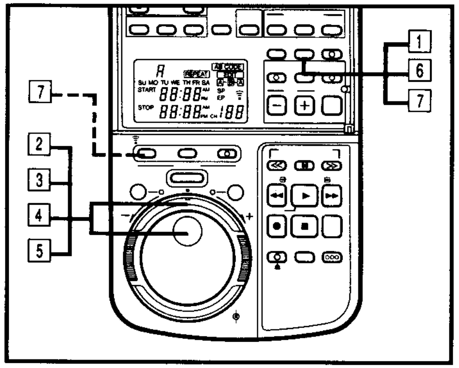
㊹ **SHUTTLE ring (outer control)**
Use for variable speed search and for timer and clock setting.

㊺ **JOG dial (inner control)**
Use for jog search, for timer and clock setting, and for channel selection.

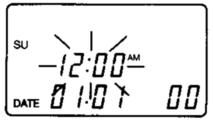
㊻ **JOG/SHUTTLE button and indicator**
Press this button first when you are going to use the JOG/SHUTTLE controls for search. The indicator will light, and will automatically turn off after about one minute if the JOG/SHUTTLE controls are left unused.

LCD CLOCK SETTING

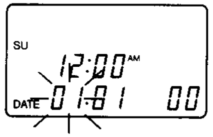
The LCD clock is independent of the recorder's clock. The recorder's clock can be adjusted from the remote control unit, if its transfer function is used.



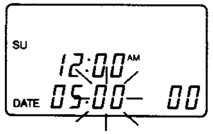
Insert four "AA"-size batteries (provided) into the remote control (see page 12.) The LCD shows the following with "12:00" blinking.



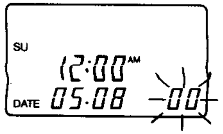
1 Press the CLOCK ADJ button.
- The month position of the DATE indication will blink.



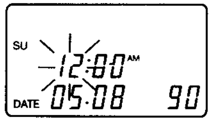
2 Turn the JOG dial until the number for the month appears, then turn the SHUTTLE ring clockwise.
- The day indication will blink.



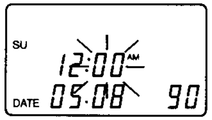
3 Turn the JOG dial until the number for the day appears, then turn the SHUTTLE ring clockwise.
- The year indication will blink.



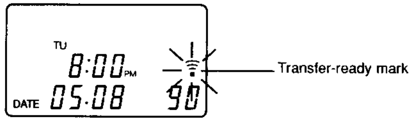
4 Turn the JOG dial until the number for the year (the last two digits) appears, then turn the SHUTTLE ring clockwise.
- The hour indication will blink.
- If an invalid date is entered, the year indication will continue blinking.



5 Turn the JOG dial to set the hour (with the correct AM or PM indication), then turn the SHUTTLE ring clockwise.
- The minute indication will blink.



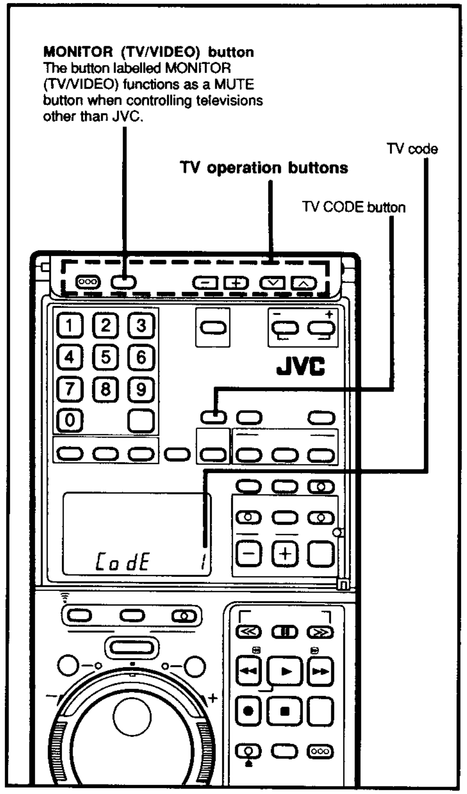
6 Turn the JOG dial to set the minute, then press the CLOCK ADJ button at the exact instant of the time signal.
- The LCD clock will be set accurately to the second.
- The transfer-ready mark will appear and blink.
- The day-of-the-week indication will be displayed automatically.



7 If you want to transfer the clock data to the recorder, direct the remote control to the recorder's remote sensor window and, within 10 seconds (while the transfer-ready mark is blinking), press the TRANS button.
- If the transfer-ready mark disappears before transmission, press the CLOCK ADJ button twice to make it reappear, then press the TRANS button while the transfer-ready mark is blinking.
- To readjust the clock, press the CLOCK ADJ button once and then turn the SHUTTLE ring either direction so that the item which requires correction blinks. Then turn the JOG dial to enter the correct data.
- When readjusting the clock, the hour indication will blink after pressing the CLOCK ADJ button, while the previously-entered DATE is displayed.

TV CODE SETTING

The provided remote control can operate the basic functions (power on/off, volume, channel, and TV/VIDEO switching) of your television. In addition to JVC televisions, other manufacturers' televisions listed here can also be controlled by setting the remote control to the corresponding TV code. If your television is a JVC brand, you do not have to set the TV code.



MONITOR (TV/VIDEO) button
The button labelled MONITOR (TV/VIDEO) functions as a MUTE button when controlling televisions other than JVC.

TV BRAND NAME	CODE	TV BRAND NAME	CODE
JVC	1	J.C. PENNEY	4
		J.C. PENNEY	12
AKAI	4	PHILCO	3
AOC	4	PHILCO	4
CENTURION	12	PHILIPS	8
CORONADO	3	PORTLAND	3
CURTIS-MATHES	12	QUASAR	6
DAYTRON	12	RADIO SHACK	5
EMERSON	3	RADIO SHACK	14
EMERSON	4	RCA	4
EMERSON	14	RCA	10
FISHER	11	SAMPO	12
GENERAL ELECTRIC	6	SAMSUNG	3
GENERAL ELECTRIC	10	SAMSUNG	12
GOLDSTAR	3	SANYO	11
GOLDSTAR	4	SCOTT	12
HITACHI	2	SEARS	7
HITACHI	3	SEARS	11
KMC	3	SHARP	3
KTV	3	SHARP	5
KTV	4	SONY	9
MAGNAVOX	3	SYLVANIA.	8
MAGNAVOX	8	SYLVANIA	12
MAGNAVOX	12	TEKNIKA	3
MARANTZ	4	TEKNIKA	8
MARANTZ	13	TEKNIKA	14
MGA/MITSUBISHI	4	TOSHIBA	7
MGA/MITSUBISHI	12	WARDS	3
MGA/MITSUBISHI	13	WARDS	4
NEC	4	WARDS	12
NEC	12	YORX	12
PANASONIC	6	ZENITH	15

Procedure

1 Press the TV CODE button.
- The LCD will switch to the TV code setting mode.
- The TV code is initially set to "1" (JVC).

2 Check the TV Code Table on the right and enter the TV code number corresponding to the brand of your television with 10-key input.
- Numerals other than 1 through 15 will be rejected, and the previous code data will remain on the LCD.

3 Press the TV CODE button.
- The LCD will return to the clock mode.
- The TV code will return to initial "1" if you press the RESET button (see page 11), or replace the batteries.

Notes:

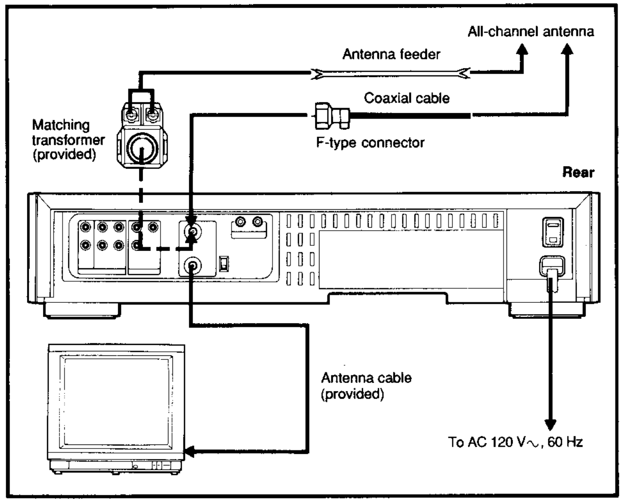
- The remote control's default TV code is "1", which enables control of JVC televisions. If your television is a brand other than JVC, it will be necessary to set to the appropriate TV code. In this case, it is necessary to test the response of your television set to each non-default TV code (2 — 15) until the appropriate code is reached.
- If your television does not respond to any of the available TV codes (1 — 15), it cannot be controlled by this remote control unit.
- Whenever you replace batteries in the remote control or press the remote's RESET button, all set data in the LCD memory reverts to the initial state and the TV code reverts to default "1". If your television is not JVC, it will be necessary to re-set to the appropriate TV code.

IMPORTANT

Although the provided remote control unit is compatible with many television brands, there is a possibility that it will not work with your television set.

CONNECTIONS

TO VHF AND UHF ANTENNAS



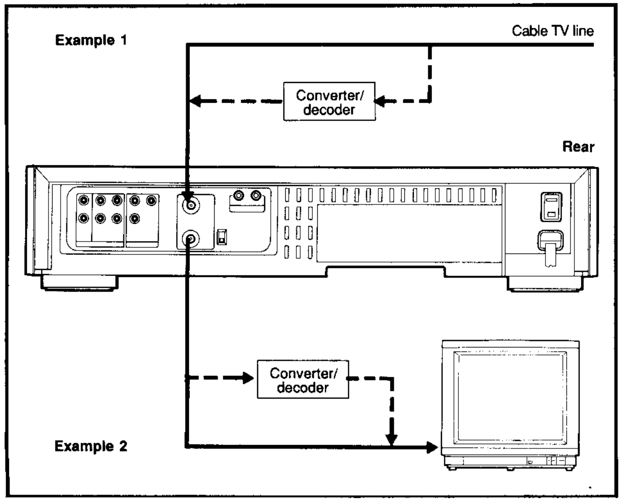
Procedure

- Remove the antenna cable from the TV receiver and reconnect to the recorder's ANT IN connector as illustrated. The recorder is then ready to record off-air programs.

  Notes:
  - If your antenna cable is a 300-ohm flat feeder, use the provided matching transformer.
  - If your antenna system has separate VHF/UHF lead-in wires, use an antenna mixer and connect its output to the recorder's ANT IN connector, either directly or through the provided matching transformer depending on the type of the mixer.
- Connect the recorder to the TV receiver using the 75-ohm antenna cable (provided).

  Note:
  If your TV is equipped with 300-ohm UHF input terminals and a 75-ohm VHF input terminal, use an antenna splitter to complete connection.

TO A CABLE TV LINE



Example 1

- You can record any scrambled cable TV channel while watching it.
- Select the recording channel on the converter/decoder.
- Set the recorder to the output channel of the converter/decoder (channel 3 or 4).
- Set the TV receiver to channel 3 or 4.
- Set the TV/VIDEO button on the recorder to VIDEO (the VIDEO indicator lights).

Example 2

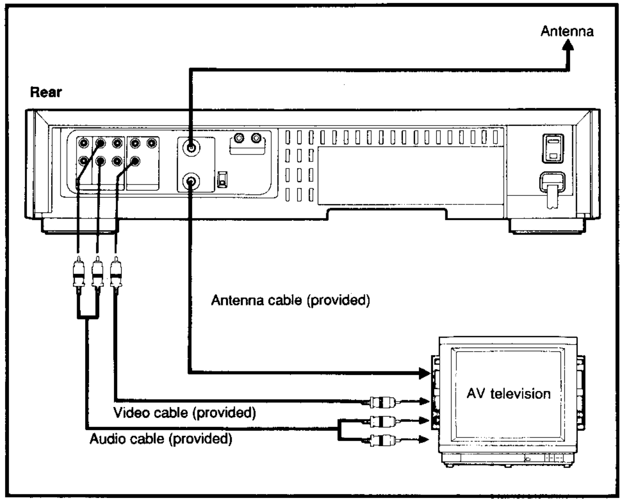
- You can record any non-scrambled cable TV channel while watching it or any other channel including "scrambled signal" channels.

  Note:
  "Scrambled signal" channels cannot be recorded.
- Select the recording channel on the recorder.
- Select the viewing channel on the converter/decoder.
- Set the TV receiver to the output channel of the converter/decoder (channel 3 or 4).
- Set the TV/VIDEO button as necessary.

Note:

If your cable TV system does not require a converter/decoder for scrambled signals, you can use the cable-compatible tuner built into the recorder for viewing and recording. In this case, simply connect the cable TV line to the ANT IN terminal of the recorder and the RF OUT terminal of the recorder to your TV receiver. Please contact your cable TV company for any questions concerning hookups or cable TV operation.

TO AN AV TELEVISION



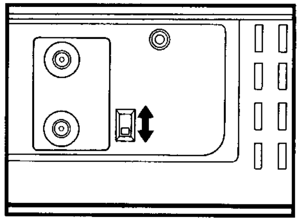
1. Connect the AUDIO OUT 1 or 2 connectors of the video recorder to the AV television's AUDIO IN jacks.
2. Connect the VIDEO OUT 1 or 2 connector to the AV television's VIDEO IN jack.
3. Connect the RF OUT terminal to the ANTENNA connector of the AV television.

Note:
With this connection, it is recommended that you set the RF output channel select switch ⓱ to the OFF position. Then the RF OUT terminal always delivers antenna signals directly to the television. To view video recordings, set the television to the AV mode.

VIDEO CHANNEL SETTING

The built-in RF converter permits playback of video and audio recordings through a TV receiver. The signals from the RF converter are viewed through a vacant channel not used for broadcasting in your viewing area.

(Rear)



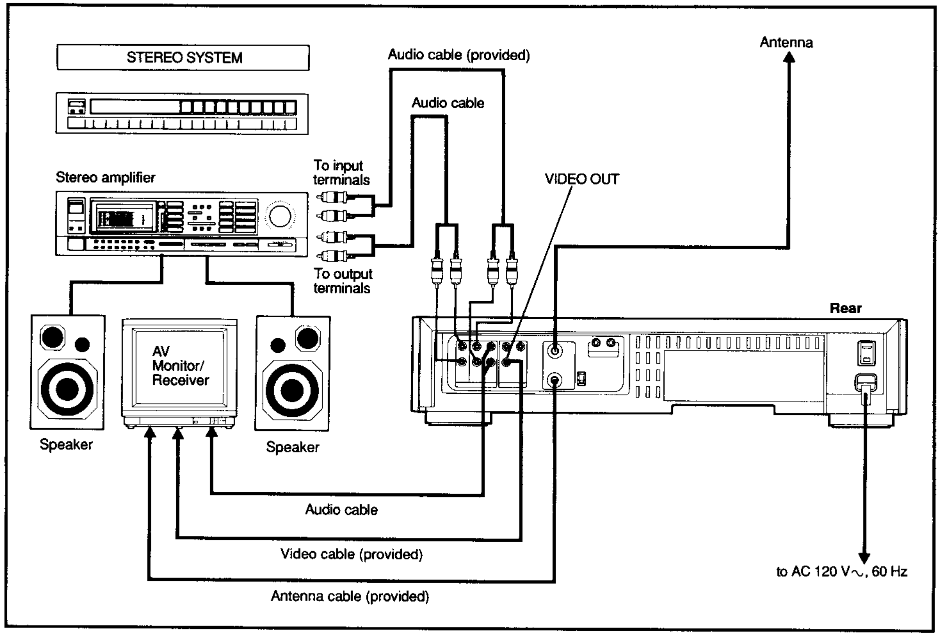
The converter channel of all units is set to 3 prior to shipment from the plant. Reset the channel to 4 in areas where channel 3 is employed for broadcasting. For this purpose, slide the channel select switch on the rear of the unit to CH 4.

This is YOUR video channel. To view video cassettes via RF OUT connection, always set the TV channel selector to either channel 3 or 4.

Notes:
- If the picture is not clear, perform fine tuning on your television.
- If the recorder is connected to a television via its VIDEO OUT and AUDIO OUT connectors, set the RF output channel select switch to OFF. With this setup, the TV/VIDEO button has no effect on the output signal, and the recorder is always in the TV mode, regardless of whether the VIDEO indicator is on or off.

Connection	RF output channel select switch	Signal from RF OUT	TV/VIDEO button	TV's mode
RF OUT + AV	OFF	Direct antenna signal always.	No effect	TV or VIDEO
RF OUT only	CH3 or CH4	Direct antenna signal in TV mode. RF channel 3 or 4 signal in VIDEO mode.	Switching is necessary depending on the intended operation.	TV

TO A STEREO SYSTEM


STEREO SYSTEM
Audio cable (provided)
Antenna
Audio cable
Stereo amplifier
To input terminals
VIDEO OUT
To output terminals
Rear
Speaker
AV Monitor/ Receiver
Speaker
Audio cable
Video cable (provided)
to AC 120 V∿, 60 Hz
Antenna cable (provided)

1. Connect the AUDIO OUT-1 or -2 L and R connectors of this recorder to the AUX IN or TAPE MONITOR terminals of the amplifier.
2. Connect the AUDIO IN L and R connectors of this recorder to the recording output terminals of the amplifier. (Exactly as one hooks up an audio cassette deck.)

Application

- If this recorder is connected to both a stereo AV television and a stereo system, you can enjoy prerecorded Hi-Fi VHS tapes in stereo by listening to them either through the stereo system or through the AV television's audio circuitry. (With monaural televisions, use a stereo system to enjoy Hi-Fi stereo video recordings.)
- You can record only audio (without recording any video signal) on both hi-fi and longitudinal audio tracks. This means you can record a continuous 8-hour FM program onto a single cassette (T-160 cassette). See page 31.

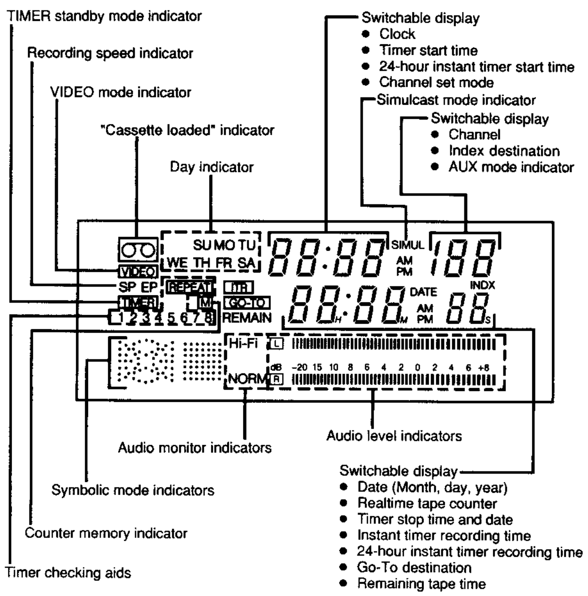
CAUTION:

- This recorder has a dynamic range of more than 90 dB with regards to its hi-fi audio capability. It is recommended that you check the maximum level if you are going to listen to the hi-fi audio signals through a stereo amplifier. A sudden surge in speaker input may cause speaker damage.
- Some speakers and televisions are specially shielded to prevent television interference. If both are of the non-shielded type, do not place the speakers adjacent to the TV set, otherwise the video playback picture will not be normal because of mutual interference.

Note:
When a video tape is played back through the RF OUT connector, the audio is reproduced always as monaural; with hi-fi stereo tapes, both channels are mixed.

DISPLAYS FOR VISUAL CHECKS OF RECORDER MODES

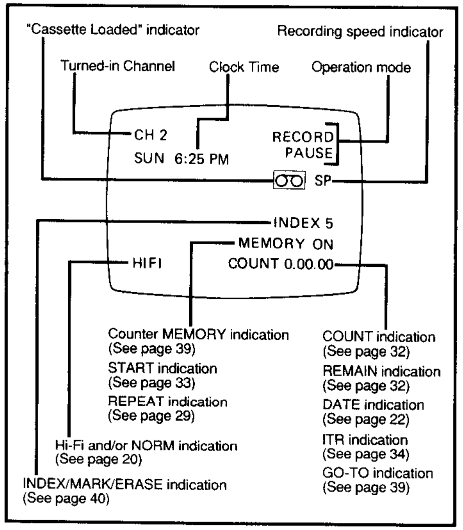
DISPLAY PANEL


TIMER standby mode indicator
Recording speed indicator
VIDEO mode indicator
"Cassette loaded" indicator
Day indicator
Switchable display
● Clock
● Timer start time
● 24-hour instant timer start time
● Channel set mode
Simulcast mode indicator
Switchable display
● Channel
● Index destination
● AUX mode indicator
SU MO TU
WE TH FR SA
VIDEO
SP EP
REPEAT
ITR
TIMER
M
GO-TO
1 2 3 4 5 6 7 8
REMAIN
88:88
SIMUL
AM PM
188
DATE
INDX
88:88
88
Hi-Fi
L
dB -20 15 10 8 6 4 2 0 2 4 6 +8
NORM
R
Audio monitor indicators
Audio level indicators
Switchable display
● Date (Month, day, year)
● Realtime tape counter
● Timer stop time and date
● Instant timer recording time
● 24-hour instant timer recording time
● Go-To destination
● Remaining tape time
Symbolic mode indicators
Counter memory indicator
Timer checking aids

Symbolic mode indicators

PLAY:	▷
FF:	▷▷
REW:	◁◁
FF VARIABLE SHUTTLE SEARCH:	▷ ▷▷
REW VARIABLE SHUTTLE SEARCH:	◁ ◁◁
STILL: FORWARD SLOW:	▷ ▯▯
STILL: REVERSE SLOW:	◁ ▯▯
RECORD:	○
RECORD PAUSE:	○ ▯▯
INSERT EDITING:	▷○
AUDIO DUBBING:	◌

ON-SCREEN DISPLAY


"Cassette Loaded" indicator
Recording speed indicator
Turned-in Channel
Clock Time
Operation mode
CH 2
SUN 6:25 PM
RECORD PAUSE
SP
INDEX 5
MEMORY ON
HIFI
COUNT 0.00.00
Counter MEMORY indication (See page 39)
START indication (See page 33)
REPEAT indication (See page 29)
Hi-Fi and/or NORM indication (See page 20)
INDEX/MARK/ERASE indication (See page 40)
COUNT indication (See page 32)
REMAIN indication (See page 32)
DATE indication (See page 22)
ITR indication (See page 34)
GO-TO indication (See page 39)

The following display is available when the ON-SCREEN item is set to "ON" on the VCR SET UP menu. (See page 24.)

Automatic indication

- Channel display
  Each time a different channel is selected, the tuned-in channel will be displayed on the screen for 5 seconds. (No channel display is available during tape playback.)
- Operation mode
  Each time the operation mode is changed, the engaged mode is displayed. RECORD (5 sec, together with channel, cassette mark and tape speed), PLAY (5 sec), FF/REW (5 sec, only when engaged from Stop mode), and RECORD PAUSE, (as long as the Pause mode is engaged).
- "Cassette Loaded" mark
  The mark is displayed for 5 seconds when a cassette is inserted, and blinks until the cassette is ejected when the EJECT button is pressed.

Manual recall

- For checking of the mode, press the ENTER button on the remote control. The corresponding indications above will be available on the screen together with the clock time for 5 seconds.
- The manually-called COUNT or REMAIN indication remains on the screen until the ENTER button is pressed again.

INFORMATION ON THE AUDIO SYSTEM

Hi-Fi AND NORMAL AUDIO

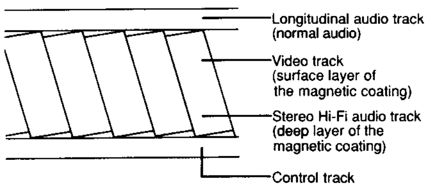
This recorder has two audio systems: Hi-Fi audio and normal audio. Hi-Fi audio signals (2-channel) are recorded deep into the tape's magnetic coating of the video track section, while normal audio signals are recorded on the usual longitudinal audio track.

CAUTION:

- The Hi-Fi soundtrack cannot be reproduced with video equipment other than Hi-Fi VHS.
- The normal soundtrack is compatible with any VHS equipment.

Tape pattern recorded with this recorder

The Hi-Fi and normal soundtracks are recorded simultaneously.


Longitudinal audio track (normal audio)
Video track (surface layer of the magnetic coating)
Stereo Hi-Fi audio track (deep layer of the magnetic coating)
Control track

RECORDING OPTIONS ACCORDING TO THE SELECTED INPUT MODE

Input mode \ Track	Video track	Normal audio track (mono)	Hi-Fi audio track (2-channel)
TUNER SIMUL **(button pressed to OFF)**	TV picture (from built-in tuner)	**TV sound (from built-in tuner)**	**TV sound (from built-in tuner)**
SIMULCAST SIMUL **(button pressed to ON)**	TV picture (from built-in tuner)	**TV sound (from built-in tuner)**	Audio signal from AUDIO IN (AUDIO LINE IN)
AUX AU Channel display section	Video signal from VIDEO IN (VIDEO LINE IN)	Audio signal from AUDIO IN (AUDIO LINE IN (Mixing with microphone input is possible.)	

MTS (Multichannel Television Sound) COMPATIBILITY

Stereo and SAP (Second Audio Program) programs can be recorded; stereo on the Hi-Fi audio track, and SAP on the normal audio track. SAP recording can be defeated by setting "2ND AUDIO" on the on-screen VCR SET UP menu to "OFF". (See page 24.)

Recording options according to the type of broadcasts and 2ND AUDIO setting

Type of broadcast (indicated by SAP and STEREO indicators ● ●)	On-screen menu 2ND AUDIO setting (indicated by SAP REC indicator ●)	Audio track		
		Normal audio (mono)	Hi-Fi audio	
			L	R
Regular broadcast	Either OFF or ON	Mono	Mono	Mono
Regular + SAP (SAP: ON)	OFF	Main	Main (mono)	Main (mono)
	ON	SAP	Main (mono)	Main (mono)
Stereo + SAP (STEREO: ON, SAP: ON)	OFF	L + R mixed	Stereo	
	ON	SAP	Stereo	
Stereo broadcast (STEREO: ON)	Either OFF or ON	L + R mixed	Stereo	

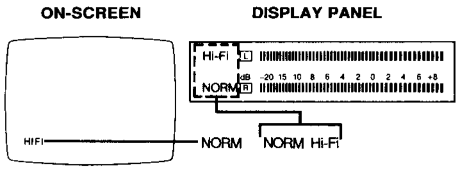
Note:

- Off-air MTS programs are received in accordance with the Broadcast Television Systems Committee (BTSC) standard. The method of transmission of stereo programs via cable varies from area to area and may not be compatible with the BTSC standard. Consult your local cable company for compatibility in your area.

DUAL-AUDIO PLAYBACK FLEXIBILITY

The AUDIO MONITOR button ⑨ on the remote control selects Hi-Fi, normal, or a mixture of the two for listening. The corresponding audio select indicator appears on the screen and the display panel ("Hi-Fi", "NORM", or both for mixed playback).

- Set to Hi-Fi to listen to the Hi-Fi soundtrack.
- Set to NORM to listen to the normal soundtrack.
- Set to Hi-Fi/NORM to listen to both.



Notes:

- This button functions during recording as well, although it has no effect on the recorded signal.
- When a tape with normal audio only is played back, the NORM mode is automatically selected.

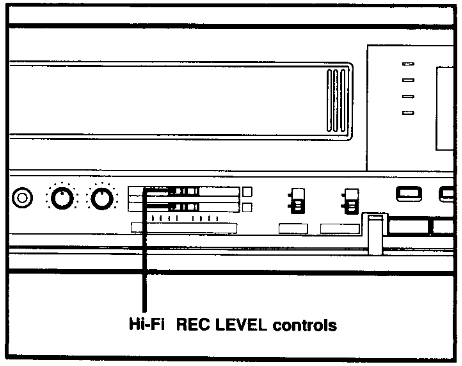
Hi-Fi AUDIO RECORDING LEVEL ADJUSTMENT

While the recording level for normal audio is always controlled automatically, the Hi-Fi audio recording level can be controlled manually with the Hi-Fi REC LEVEL controls.

- Ordinarily set the Hi-Fi REC LEVEL controls to their center position.

Manual adjustment

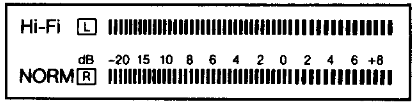
- Slide the Hi-Fi REC LEVEL controls to the right to increase the level and to the left to decrease the level, referring to the audio level indicators. When indicators up to or near 0 dB light for the loudest signal being received, the recording level is optimum. (The level at which only one red indicator lights from time to time may be most appropriate.)



Notes:

- When adjusting the Hi-Fi audio recording level, be sure to select "Hi-Fi" with the AUDIO MONITOR button, otherwise the recording level of Hi-Fi audio signals cannot be correctly indicated.
- If the recording level is too high, distortion will result; if too low, excessive noise will result.
- The normal audio signal level is also displayed by these indicators, but cannot be adjusted.
- During playback, the audio level indicators show the level of audio signals recorded on the tape and selected with the AUDIO MONITOR button.
- The audio level indicators do not light when "LEVEL INDICATOR" on the on-screen VCR SET UP menu is set to "OFF".

Audio level indicators



WHAT'S ON THE MENU?

In addition to timer programming, most setup procedures are simplified with the on-screen menu system. Available menus are:

1. TODAY'S PROGRAM — to program the timer to record TV programs which start within 24 hours.
2. PROGRAM — to program the timer to record TV programs which start at any time after 24 hours and within one month.
3. CLOCK SET — to initially set the clock, or readjust it.
4. VCR SET UP — to make basic recorder settings.
5. TUNER SET UP — to preset tuner channels.
   - Before using the recorder, be sure to set the clock.

ATTENTION

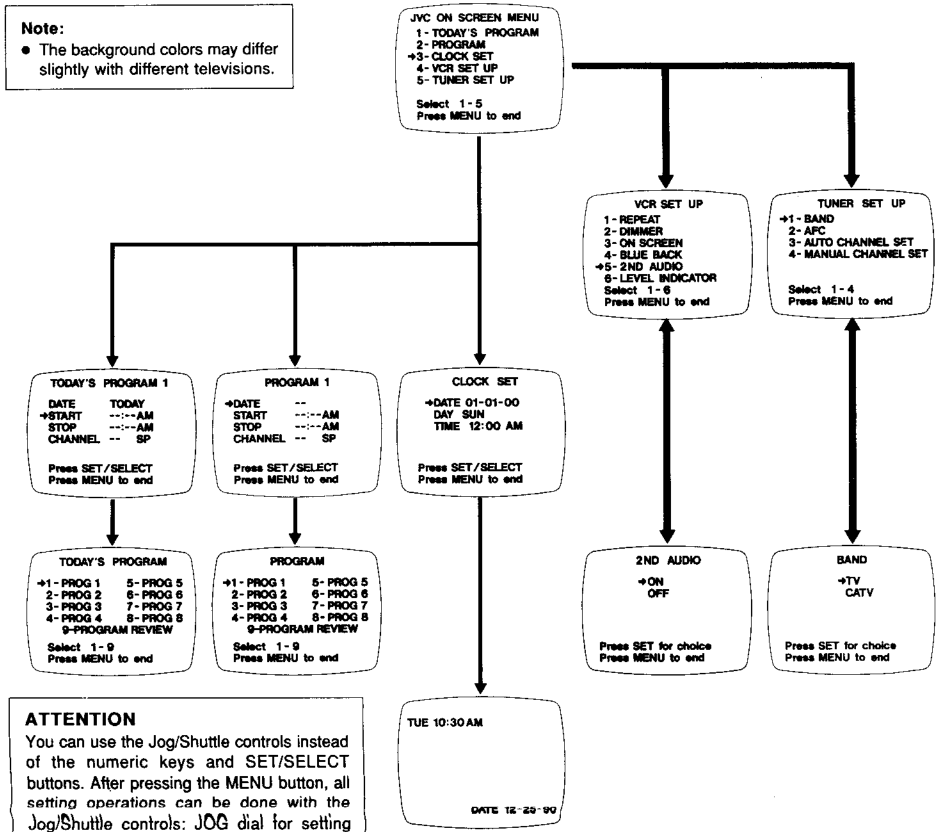
- **Before use: in order to record TV programs correctly, be sure to preset tuner channels to suit your area, using the full-auto on-screen tuner setting menu.**

Note:

- The background colors may differ slightly with different televisions.

TO GET THE ON-SCREEN MENU

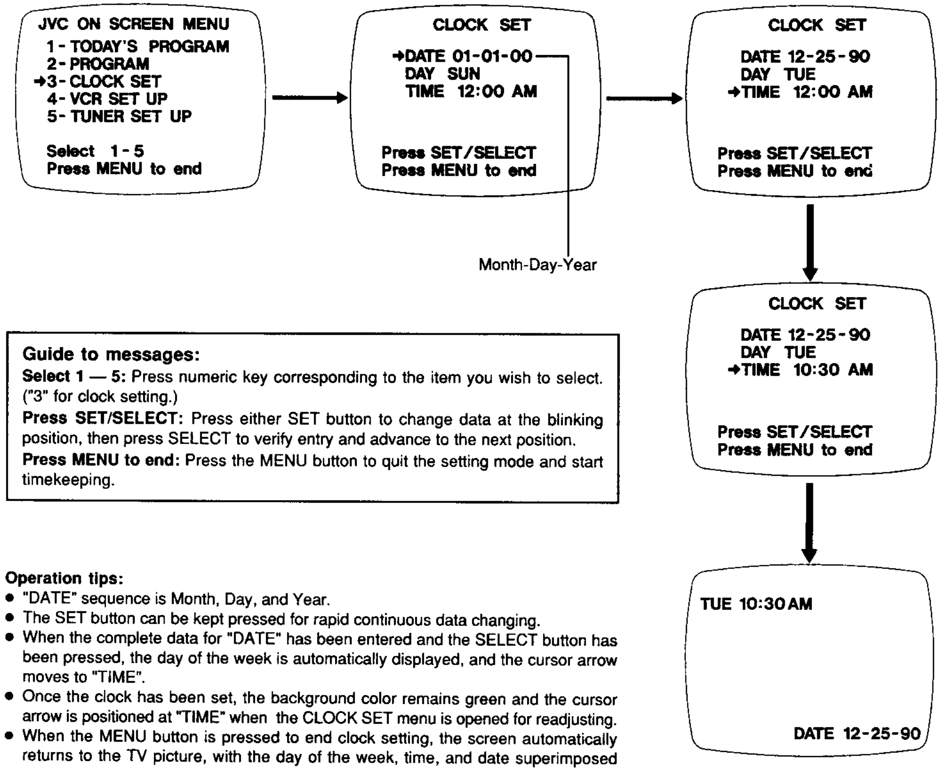
- Turn on the recorder and television, and set them correctly. (Set the recorder to the VIDEO mode for RF OUT connection, or set the television to the AV mode for AV connection. See page 16.)
  Press the MENU button. Then follow the on-screen messages.
- The changing background colors are also helpful in confirming the settings.
- For more details of each setting procedure, refer to the following pages:
  1. TODAY'S PROGRAM — page 35
  2. PROGRAM — page 36
  3. CLOCK SET — page 22
  4. VCR SET UP — page 24
  5. TUNER SET UP — page 23


JVC ON SCREEN MENU
1 - TODAY'S PROGRAM
2 - PROGRAM
→3 - CLOCK SET
4 - VCR SET UP
5 - TUNER SET UP
Select 1 - 5
Press MENU to end
VCR SET UP
1 - REPEAT
2 - DIMMER
3 - ON SCREEN
4 - BLUE BACK
→5 - 2ND AUDIO
6 - LEVEL INDICATOR
Select 1 - 6
Press MENU to end
TUNER SET UP
→1 - BAND
2 - AFC
3 - AUTO CHANNEL SET
4 - MANUAL CHANNEL SET
Select 1 - 4
Press MENU to end
TODAY'S PROGRAM 1
DATE TODAY
→START --:--AM
STOP --:--AM
CHANNEL -- SP
Press SET/SELECT
Press MENU to end
PROGRAM 1
→DATE --
START --:--AM
STOP --:--AM
CHANNEL -- SP
Press SET/SELECT
Press MENU to end
CLOCK SET
→DATE 01-01-00
DAY SUN
TIME 12:00 AM
Press SET/SELECT
Press MENU to end
2ND AUDIO
→ON
OFF
Press SET for choice
Press MENU to end
BAND
→TV
CATV
Press SET for choice
Press MENU to end
TODAY'S PROGRAM
→1 - PROG 1 5 - PROG 5
2 - PROG 2 6 - PROG 6
3 - PROG 3 7 - PROG 7
4 - PROG 4 8 - PROG 8
9-PROGRAM REVIEW
Select 1 - 9
Press MENU to end
PROGRAM
→1 - PROG 1 5 - PROG 5
2 - PROG 2 6 - PROG 6
3 - PROG 3 7 - PROG 7
4 - PROG 4 8 - PROG 8
9-PROGRAM REVIEW
Select 1 - 9
Press MENU to end
TUE 10:30AM
DATE 12-25-90

ATTENTION

You can use the Jog/Shuttle controls instead of the numeric keys and SET/SELECT buttons. After pressing the MENU button, all setting operations can be done with the Jog/Shuttle controls: JOG dial for setting data (SET) and SHUTTLE ring for verifying entry and advancing to the next position (SELECT).

ON-SCREEN CLOCK SETTING


JVC ON SCREEN MENU
1 - TODAY'S PROGRAM
2 - PROGRAM
→3 - CLOCK SET
4 - VCR SET UP
5 - TUNER SET UP
Select 1 - 5
Press MENU to end
CLOCK SET
→DATE 01-01-00
DAY SUN
TIME 12:00 AM
Press SET/SELECT
Press MENU to end
Month-Day-Year
CLOCK SET
DATE 12-25-90
DAY TUE
→TIME 12:00 AM
Press SET/SELECT
Press MENU to end
CLOCK SET
DATE 12-25-90
DAY TUE
→TIME 10:30 AM
Press SET/SELECT
Press MENU to end
TUE 10:30AM
DATE 12-25-90

Guide to messages:

Select 1 — 5: Press numeric key corresponding to the item you wish to select. ("3" for clock setting.)

Press SET/SELECT: Press either SET button to change data at the blinking position, then press SELECT to verify entry and advance to the next position.

Press MENU to end: Press the MENU button to quit the setting mode and start timekeeping.

Operation tips:

- "DATE" sequence is Month, Day, and Year.
- The SET button can be kept pressed for rapid continuous data changing.
- When the complete data for "DATE" has been entered and the SELECT button has been pressed, the day of the week is automatically displayed, and the cursor arrow moves to "TIME".
- Once the clock has been set, the background color remains green and the cursor arrow is positioned at "TIME" when the CLOCK SET menu is opened for readjusting.
- When the MENU button is pressed to end clock setting, the screen automatically returns to the TV picture, with the day of the week, time, and date superimposed over the picture for about 5 seconds.

ATTENTION

You can use the Jog/Shuttle controls instead of the numeric keys and SET/SELECT buttons. After pressing the MENU button, all setting operations can be done with the Jog/Shuttle controls: JOG dial for setting data (SET) and SHUTTLE ring for verifying entry and advancing to the next position (SELECT).

Power Failure Indicator

The clock display may reset to "SU 12:00 AM" and start to blink. This is not a malfunctioning of the clock, but it indicates that there has been a power failure in excess of 60 seconds. Readjusting the time restores the normal condition of the clock display.

- If the period of power outage is within about 60 seconds, correct time-keeping continues when power is reapplied.

ON-SCREEN TUNER SETTING

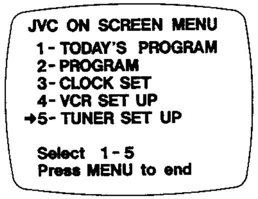
This recorder incorporates an advanced 181-channel cable-compatible frequency synthesized tuner which can be preset on the on-screen menu. First set "BAND" and "AFC" correctly, then proceed to channel presetting either with "AUTO CHANNEL SET" or "MANUAL CHANNEL SET".

BAND
- Set to "TV" if your antenna system is regular broadcast VHF/UHF, VHF only, or UHF only.
- Set to "CATV" if your antenna system is a cable TV line with or without a CATV channel converter/decoder unit.

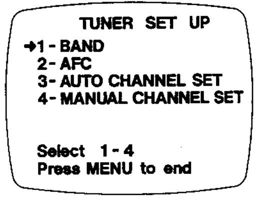
AFC
- Normally set to "NORM".
- Reset to "SPCL" if no picture appears.

AUTO CHANNEL SET
- Select this item when you wish all available channels to be stored automatically. **We recommend that you use this mode for initial tuner setting.**

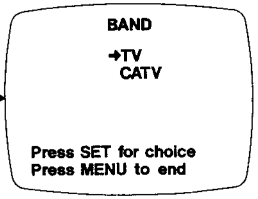
MANUAL CHANNEL SET
- Select this item when you wish to store only your favorite channels, to restore skipped channels, or skip previously stored channels.



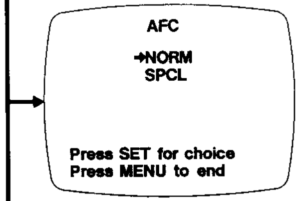
JVC ON SCREEN MENU
1 - TODAY'S PROGRAM
2 - PROGRAM
3 - CLOCK SET
4 - VCR SET UP
→5 - TUNER SET UP
Select 1 - 5
Press MENU to end



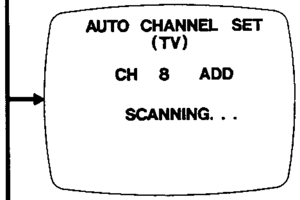
TUNER SET UP
→1 - BAND
2 - AFC
3 - AUTO CHANNEL SET
4 - MANUAL CHANNEL SET
Select 1 - 4
Press MENU to end



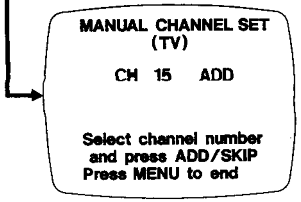
BAND
→TV
CATV
Press SET for choice
Press MENU to end



AFC
→NORM
SPCL
Press SET for choice
Press MENU to end



AUTO CHANNEL SET
(TV)
CH 8 ADD
SCANNING. . .



MANUAL CHANNEL SET
(TV)
CH 15 ADD
Select channel number
and press ADD/SKIP
Press MENU to end

Operation tips:

- When the AUTO CHANNEL SET menu is opened, scanning will start automatically from the lowest channel in the specified band (TV or CATV). During scanning, the message "SCANNING..." will be displayed. Available channels will be stored with "ADD" displayed briefly (superimposed over the TV picture), and unavailable channels will be skipped with "SKIP" displayed.
- After completion of scanning, the number of the lowest stored channel is displayed.
- For information on correspondence between channel numbers and CATV stations refer to the inserted "CATV Channel Reference Chart".

ATTENTION

You can use the Jog/Shuttle controls instead of the numeric keys and SET/SELECT buttons. After pressing the MENU button, all setting operations can be done with the Jog/Shuttle controls: JOG dial for setting data (SET) and SHUTTLE ring for verifying entry and advancing to the next position (SELECT).

Guide to messages:

Press SET for choice: Press either SET button to select the required mode. Changing the mode changes the back-ground color.

Press MENU to end: Press the MENU button to verify entry and quit the current setting mode. The screen will change to the TUNER SET UP menu. To immediately return to the normal TV picture from any of the setting modes, press MENU twice.

Select channel number and press ADD/SKIP: By direct 10-key input or channel up/down scanning, specify the channel you wish to store or skip, and then press the ADD button to store it, or SKIP button to skip it. Now the skipped channels will not appear during up/down channel scan tuning.

ON-SCREEN VCR SETTING

Six items can be set with the on-screen VCR SET UP menu.

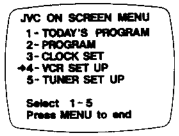
1. REPEAT: To select the desired repeat playback mode. Initially this item is set to "NO" (no repeat). For repeat playback, see "CONVENIENT FACILITIES RELATED TO PLAYBACK" on page 29.
2. DIMMER: To subdue the brightness of the display panel. Initially this item is set to "OFF". If the display panel is too bright, select this item and set it to "ON".
3. ON SCREEN: To take advantage of the on-screen mode display as described on page 18. Initially this item is set to "ON". If you do not want the on-screen display, select this item and set it to "OFF".
4. BLUE BACK: To obtain a blue screen with no audio noise when no signal is available — from tuner, tape, or external source. Initially this item is set to "ON". If you need to view programs from distant stations, select this item and set it to "OFF".
5. 2ND AUDIO: To record the second audio program (SAP) when an SAP program is being received, set to "ON". (See chart on page 19.) Set to "OFF" to record the main audio program only.
6. LEVEL INDICATOR: Initially this item is set to "ON" so that the audio level indicators light on the display panel. If you do not want them to light on the display panel, select this item and set it to "OFF".

Guide to messages:

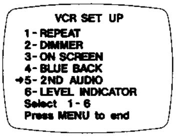
Select 1 — 6: Press numeric key corresponding to the item you wish to select.

Press SET for choice: Press either SET button to select the required mode. Changing the mode changes the background color.

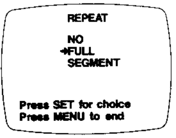
Press MENU to end: Press to verify entry and quit the current setting mode. The screen will change to the VCR SET UP menu. To immediately return to the normal TV picture from any of the setting modes, press MENU two times.



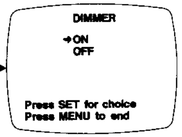
JVC ON SCREEN MENU
1 - TODAY'S PROGRAM
2 - PROGRAM
3 - CLOCK SET
→4 - VCR SET UP
5 - TUNER SET UP
Select 1 - 5
Press MENU to end



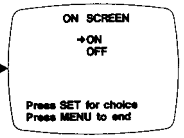
VCR SET UP
1 - REPEAT
2 - DIMMER
3 - ON SCREEN
4 - BLUE BACK
→5 - 2ND AUDIO
6 - LEVEL INDICATOR
Select 1 - 6
Press MENU to end



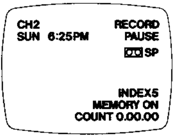
REPEAT
NO
→FULL
SEGMENT
Press SET for choice
Press MENU to end



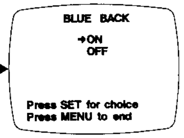
DIMMER
→ON
OFF
Press SET for choice
Press MENU to end



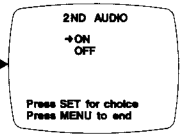
ON SCREEN
→ON
OFF
Press SET for choice
Press MENU to end



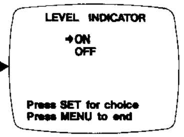
CH2 RECORD
SUN 6:25PM PAUSE
SP
INDEX5
MEMORY ON
COUNT 0.00.00



BLUE BACK
→ON
OFF
Press SET for choice
Press MENU to end



2ND AUDIO
→ON
OFF
Press SET for choice
Press MENU to end



LEVEL INDICATOR
→ON
OFF
Press SET for choice
Press MENU to end

ATTENTION

You can use the Jog/Shuttle controls instead of the numeric keys and SET/SELECT buttons. After pressing the MENU button, all setting operations can be done with the Jog/Shuttle controls: JOG dial for setting data (SET) and SHUTTLE ring for verifying entry and advancing to the next position (SELECT).

LOADING AND UNLOADING A CASSETTE

Motorized Loading System

- *The cassette can be loaded even when the power has not been turned on. Inserting a cassette into the loading slot turns the* power on automatically.
- The cassette can be unloaded even when the power has been turned off. If a cassette is inside, pressing the EJECT button turns the power on automatically and, after ejection of the cassette, shuts it off automatically.

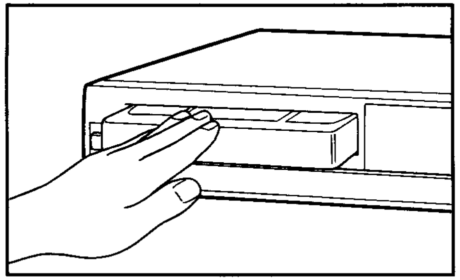
Auto-Play System

- Inserting a cassette, with its safety tab removed, turns the recorder on and playback of the cassette begins automatically.

LOADING

Insert a cassette as illustrated with its labelled side facing you.

- With a cassette inserted, the ⊡ mark to indicate "cassette inserted" appears on screen and the display panel.



Notes:

- Be sure to insert the cassette firmly into the slot; otherwise it will be automatically ejected.
- The automatic loading mechanism will operate only when the cassette is inserted correctly.

UNLOADING

Press the EJECT button in the Stop mode. The cassette will be ejected with the ⊡ mark blinking.

Caution

- If unloading of a cassette is not possible, check to see whether the TIMER indicator is lit. If so, press the TIMER button so the TIMER indicator extinguishes.
- Do not attempt to pull out the cassette once automatic loading has started.

WARNING

- Do not insert fingers or any foreign object beyond the door flap of the cassette loading slot, as this could lead to injury or damage to the mechanism. Show special caution with children.

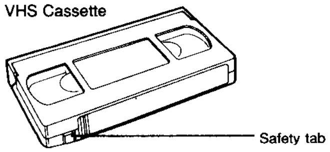
USABLE CASSETTES AND THEIR RECORDING TIME

Both regular VHS and Super VHS cassettes can be used with this video recorder for recording. However, only regular VHS recordings can be made and played back on this video recorder. Super VHS recordings can neither be made nor played back on this video recorder.

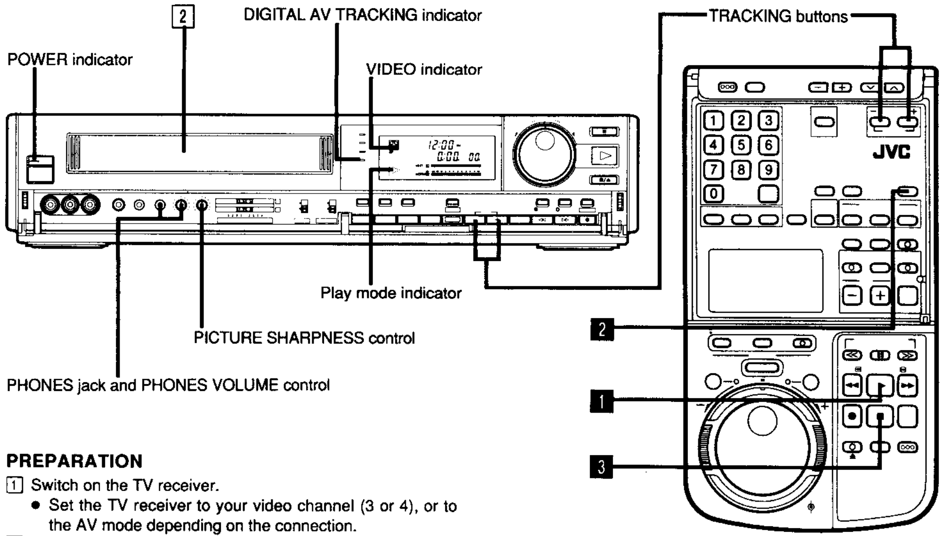
Type of Cassette	Recording/Playback Time	
	SP (Standard Play)	EP (Extended Play)
T-30	30 minutes	1 hour, 30 minutes
T-60	1 hour	3 hours
T-90	1 hour, 30 minutes	4 hours, 30 minutes
T-120	2 hours	6 hours
T-160	2 hours, 40 minutes	8 hours

ACCIDENTAL ERASURE PREVENTION

- Video cassettes are equipped with a safety tab to prevent accidental erasure. When the tab is removed, recording cannot be performed. If you wish to record on a cassette whose tab has already been removed, use adhesive tape to block the hole.



PLAYING BACK A VIDEO CASSETTE


2
DIGITAL AV TRACKING indicator
POWER indicator
VIDEO indicator
TRACKING buttons
JVC
Play mode indicator
PICTURE SHARPNESS control
PHONES jack and PHONES VOLUME control
2
1
3

PREPARATION

1 Switch on the TV receiver.
- Set the TV receiver to your video channel (3 or 4), or to the AV mode depending on the connection.

2 Load a pre-recorded cassette.
- Power will be switched on automatically.
- When a cassette with its safety tab removed is loaded, playback starts automatically with the Play mode indicator appearing on the display panel and "PLAY" on the screen for 5 seconds.

DIGITAL AV TRACKING SYSTEM

This recorder incorporates a digital tracking system for automatic tracking adjustment. In most cases you do not have to adjust the tracking.

- When you start playback after inserting a tape, the digital tracking system automatically adjusts the tape path relative to the heads to obtain the best possible pictures and hi-fi stereo sound.
- If there is no recorded Hi-Fi audio, tracking is set referring only to the video signal. The audio output is automatically switched to normal audio.
- This automatic tracking adjustment also takes place when the playback output level drops below a certain level.
- The DIGITAL AV TRACKING indicator ❾ blinks while the system is searching for optimum tracking, and remains lit as long as the automatic tracking mode continues.

If automatic tracking fails, and some noise bars are visible on the screen, use the manual tracking mode.

- Press both TRACKING buttons (⓴ ⑤) simultaneously to cancel the automatic mode, then press either button to move noise bars out of the screen.
- To return to the automatic mode, press both buttons simultaneously.

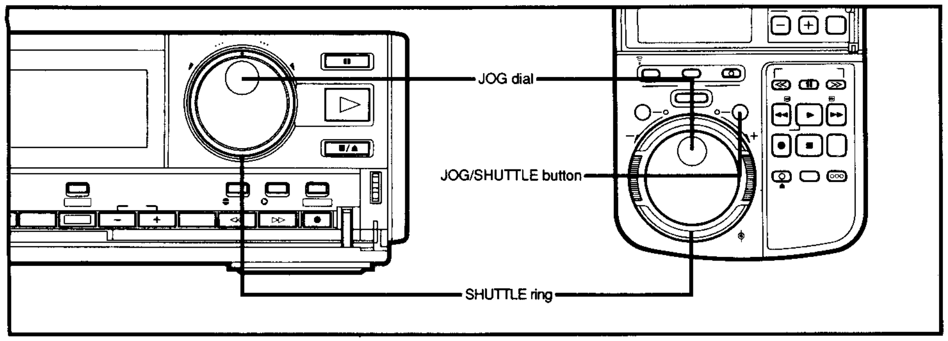
OPERATING PROCEDURE

1 Press the PLAY button.
2 Make AUDIO MONITOR setting as required. (See page 20.)
3 Press the STOP button at the end of the program.

Notes:

- The SP/EP button may be in either position. The SP, LP or EP mode recording is automatically detected and played back at the correct speed.
- For various convenience facilities and special-effects features available during playback, see the next three pages.
- When the PLAY button is pressed to start playback, the VIDEO mode is automatically entered and the VIDEO indicator lights.
- The tape-end auto-rewind mechanism functions in the Play, Fast Forward and Forward Search modes.
- Images on the screen can be adjusted to a preferred softer or sharper definition by turning the PICTURE SHARPNESS control.
- When listening through headphones, if the volume is too low or too high, adjust the PHONES VOLUME control for comfortable listening.

SPECIAL-EFFECTS PLAYBACK WITH JOG/SHUTTLE CONTROLS



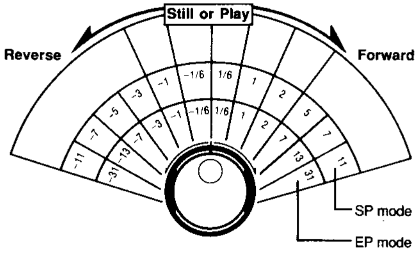
VARIABLE-SPEED SEARCH AND SLOW MOTION

SHUTTLE ring

(When using the remote control's SHUTTLE ring, first press the JOG/SHUTTLE button so that its LED indicator lights.)

By turning the SHUTTLE ring clockwise or counterclockwise, variable-speed search is possible in either the forward or reverse direction either from the Play or Still mode.

- To search in the forward direction, turn the SHUTTLE ring gradually clockwise. The farther the ring is rotated, the faster the search speed becomes – from 1/6 to 11 times normal in the SP mode and from 1/6 to 31 times normal in the EP mode.
- To search in the reverse direction, turn the SHUTTLE ring counterclockwise. The farther the ring is rotated, the faster the search speed becomes – from –1/6 to –11 times normal in the SP mode and from –1/6 to –31 times normal in the EP mode.
- Releasing the SHUTTLE ring engages the Still mode.



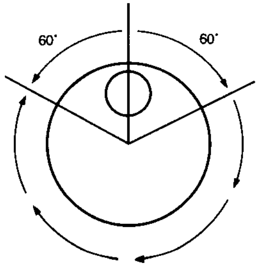
FRAME-BY-FRAME PLAYBACK

JOG dial

(When using the remote control's JOG dial, first press the JOG/SHUTTLE button so that its LED indicator lights.)

The inner JOG dial allows continuous frame-by-frame search in both directions. By turning it in either direction while in the Still mode, the tape can be advanced or moved back a frame at a time for precise location of a specific point in a scene. (This function is especially convenient for locating edit-in and edit-out points during editing.)

- Turn the JOG dial clockwise while in the Still mode to advance the picture; counterclockwise to move the picture back.
- Each 60-degree turn of the JOG dial in either direction, moves the picture forward or back by one frame.
- If the JOG dial is rotated at a speed of about one revolution per second, the picture moves at about 1/6 normal speed. If rotated at about two revolutions per second, the picture moves at about normal playback speed.



SPECIAL-EFFECTS PLAYBACK WITH OTHER BUTTONS

VARIABLE SEARCH buttons

In addition to having the same variable-search speeds as the SHUTTLE ring, slower searching speeds are possible in either direction from either the Play or Still mode by pressing the VARIABLE SEARCH buttons on the remote control.

To search in the forward direction:

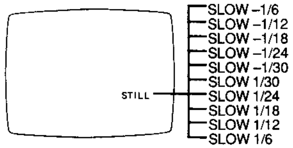
- Press the >> button in the Play mode to start fast-motion searching from 2 times normal speed. To increase speed, press >> repeatedly.
- Press the >> button in the Still mode to start slow-motion searching from 1/30 normal speed. To increase speed, press >> repeatedly. To decrease speed, press << repeatedly. (Pressing the << button in the Play mode, starts slow-motion searching at 1/6 normal speed.)

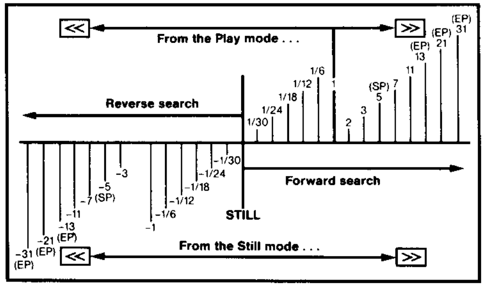
To search in the reverse direction:

- Press the << button in the Still mode to start searching in the reverse direction at the same speed as normal speed playback. To increase speed, press << repeatedly. To decrease speed, press >> repeatedly.

To return to the normal Play mode, press the PLAY button.

ON-SCREEN DISPLAY

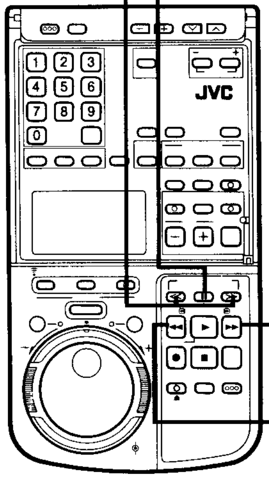




STILL PLAYBACK AND FRAME ADVANCE

PAUSE/STILL button

- To view a still picture, press this button in the Play mode.
- To advance the picture frame by frame, press this button again.
- To return to normal playback, press the PLAY button.
- When the Still mode continues for longer than about 5 minutes, the Stop mode will be entered automatically.



HIGH-SPEED FORWARD SEARCH

FF button

- To fast forward the tape, press this button in the Stop mode.
- To shuttle search the tape in the forward direction, press this button in the Play mode.
- The shuttling speed is about 7 times normal in the SP mode and 21 times normal in the EP mode.
- Press the PLAY button to return to normal playback.
- For briefer scanning, keep the FF button pressed for more than 2 seconds; when you release the button, the Search mode will be cancelled. In this case, the shuttling speed in the EP mode is about 13 times normal.

HIGH-SPEED REVERSE SEARCH

REW button

- To rewind the tape, press this button in the Stop mode.
- To shuttle search the tape in the reverse direction, press this button in the Play mode.
- The shuttling speed is about 7 times normal in the SP mode and 21 times normal in the EP mode.
- Press the PLAY button to return to normal playback.
- For briefer scanning, keep the REW button pressed for more than 2 seconds; when you release the button, the Search mode will be cancelled. In this case, the shuttling speed in the EP mode is about 13 times normal.

Notes:

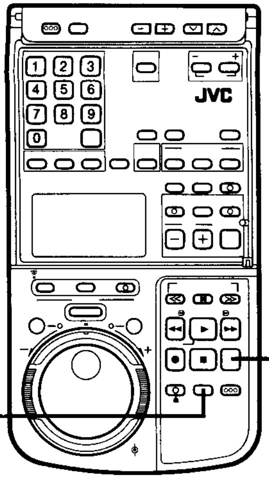
- With some televisions, the still picture may be unstable. If vertical vibration of the picture is observed, attempt to correct it by pressing the V.LOCK buttons.
- If noise bars are visible in the Still, Slow, or Frame-by-Frame mode, attempt to correct it in the manual tracking mode as described on page 26.
- When the Still mode is engaged from reverse search, the still picture may slightly shift after a moment because the mode is switched to forward search.
- No audio is available during any special-effects playback mode.
- With some video cassettes, the TV picture may distort during slow-motion playback. This is not due to any defect of the unit.
- Special-effects playback is not possible in the LP mode.
  When a special-effects mode is engaged during playback of LP recorded tapes, the picture disappears from the screen. If you happen to engage one of the special-effects modes while playing an LP tape, simply press the PLAY button to restore the picture.

CONVENIENT FACILITIES RELATED TO PLAYBACK

TV MONITOR

When viewing a video tape, you can check the TV program being received by the VCR's built-in tuner without stopping the tape.

- Press the TV MONITOR button to check TV programs during tape playback. The tuned-in TV program will be visible on the screen until the TV MONITOR button is pressed again.
- If you press the TV MONITOR button after engaging a visual search mode, such as Skip Search, the TV screen will switch to TV, and normal tape playback will automatically resume after the specified point is reached. Index Search and Realtime Go-To in the visual search mode (refer to pages 39 and 40) can be carried out while you are watching the TV program.



SKIP SEARCH

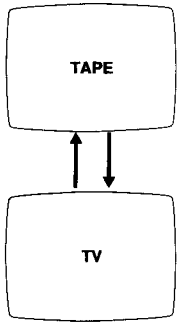
During playback, press the SKIP SEARCH button from 1 to 4 times to zip through 30-sec. to 2-min. sections of tape. Playback resumes automatically. Press the PLAY button to cancel the Skip Search mode midway.

MEMORY PLAY

If you want to watch the tape from its beginning after rewinding, you do not have to wait for completion of rewind to press the PLAY button.

- Press the REW button and then PLAY button within 2 seconds. Playback will start automatically at the beginning of the tape. (Check to see that the counter memory indicator 🄼 is off).

  If you want to watch the tape from the counter reading of "0H 00M 00S", press the COUNTER MEMORY button to obtain 🄼 . Then, press the REW (or FF) button and then PLAY.
- While the tape is being rewound, the PLAY indicator is blinking. To cancel the Memory Play mode and go to another mode, press the corresponding button (STOP, PLAY, FF, REW).



Note:

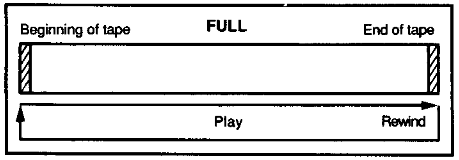
- For various tape access methods that can be used in different applications, refer to pages 39 and 40.

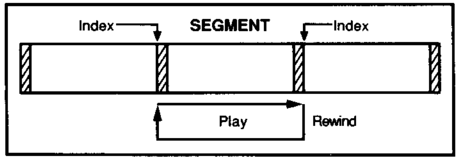
More Next-Function Memory Features

If you are going to eject the cassette, or turn the power off after rewinding the tape, press the EJECT or POWER button within 2 seconds after pressing the REW button.

REPEAT PLAYBACK — FULL OR SEGMENT

This function allows you to set the VCR for repeated playback (5 times) of the entire tape ("FULL" repeat) or repeated playback (5 times) of a segment of the tape from one index mark to the next ("SEGMENT" repeat).

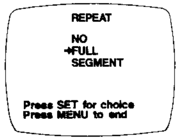




1. Open the VCR SET UP menu. (See page 24.)
2. If "SEGMENT" is selected, you can designate the segment using the Index Search mode or Index Mark function. (See page 40.)

Notes:

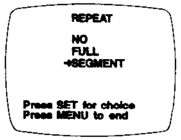
- During rewind in the Repeat mode, "REPEAT" is displayed on the screen.
- After repeat playback, be sure to reset "REPEAT" to "NO".



REPEAT

NO
→FULL
SEGMENT

Press SET for choice
Press MENU to end

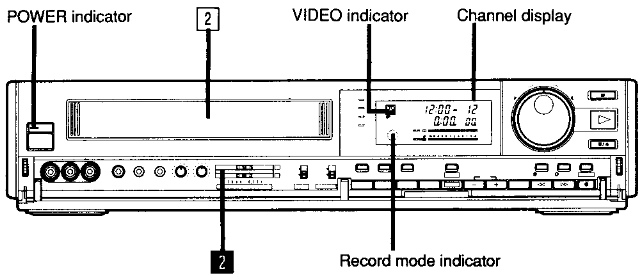


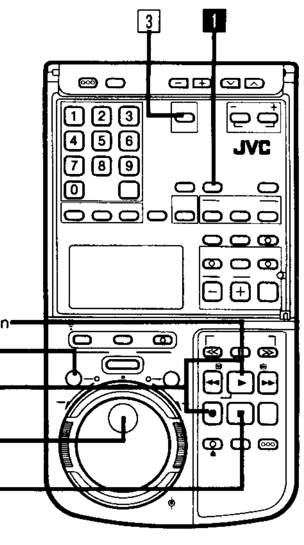
REPEAT

NO
FULL
→SEGMENT

Press SET for choice
Press MENU to end

RECORDING TV PROGRAMS





PREPARATION

1. Switch on the TV receiver.
   - Set the TV receiver to your video channel (3 or 4), or to the AV mode (depending on the connection).
2. Load a cassette (with safety tab in place). Power will be switched on automatically.
3. Press the TV/VIDEO button so that the VIDEO indicator lights.
   - Skip this step when the TV is set to the AV mode.

OPERATING PROCEDURE

1. Select the recording speed (SP or EP).

   SP: 2 hours 40 minutes with a T-160 cassette.

   EP: 8 hours with a T-160 cassette.
2. Make necessary Hi-Fi audio recording level adjustment. Refer to page 20.
3. Press the CH/SET SELECT button so that the indicator lights.
4. Select the channel you wish to record with the JOG dial.
5. Press the REC and PLAY buttons simultaneously to start recording. "MARK" will appear on the screen and blink to show that an index code is being recorded. (When using the VCR's front panel control buttons, press REC/ITR once to start recording.)
6. Press the STOP button at the end of the program.

RECORDING ONE PROGRAM WHILE WATCHING ANOTHER

A program not being viewed can be recorded while you enjoy viewing another program.

This permits the recorded program to be played back later at your convenience.

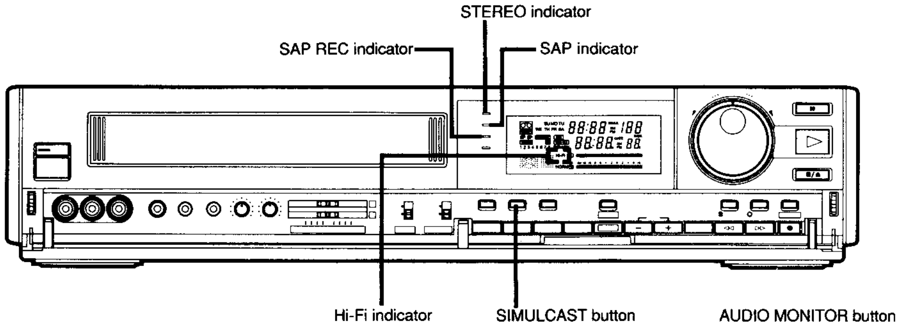
The key points to remember are:

- Select the channel you wish to record with the recorder's channel selector.
- Select the channel you wish to view with the TV receiver's channel selector.
- With RF-only connection, the TV/VIDEO button should be in the TV mode (VIDEO indicator off). If the indicator is lit, press the TV/VIDEO button to turn it off. (See page 16.)

Notes:

- If the REC/ITR button is pressed more than once, the Instant Timer Recording mode will be entered (see page 34). To return to ordinary recording, repeatedly press the REC/ITR button until the ITR indicator on the display panel goes out.
- If there is part of the program you do not want to record, press the PAUSE/STILL button. To release the Pause mode, press the PLAY button.
- When recording is restarted from the Record-Pause mode, assemble recording is performed so that the playback picture will not distort at the edit point. A few frames recorded before the pause may be erased due to overlap of the new recording. This is not due to any defect of the unit.
- When the Record-Pause mode continues for longer than about 5 minutes, the Stop mode will be entered automatically.
- If the Record mode cannot be engaged, check to see if the cassette safety tab has been removed. (See page 25).
- When the end of the tape is reached during recording, the tape is automatically rewound to the beginning and stops.
- The built-in tuner's automatic channel lock mechanism prevents the selected channel from being altered during recording. Therefore, if you wish to change the channel during recording, first engage the Record-Pause mode and then select a different channel.

OTHER RECORDING POSSIBILITIES



RECORDING STEREO TV PROGRAMS

This recorder is capable of automatically receiving stereo TV programs in stereo. When a stereo program is being received, the STEREO indicator lights and recording is made in stereo on both the Hi-Fi and normal audio tracks. To listen to the stereo soundtrack during recording, press the remote control's AUDIO MONITOR button so that the HIFI indicator lights on the screen and display panel.

RECORDING SAP (SECOND AUDIO PROGRAM) TV PROGRAMS

When an SAP TV program is being received, the SAP indicator lights. To record such a program, pay attention to two additional controls and the basic operation described on page 30.

- Set "2ND AUDIO" in the VCR SETUP menu to "ON" to record the second audio program. To record the main audio program only, set "2ND AUDIO" to "OFF". (See page 24.)
- To listen to the SAP soundtrack being recorded, press the AUDIO MONITOR select button so that the NORM indicator lights on the screen and display panel.

Note:

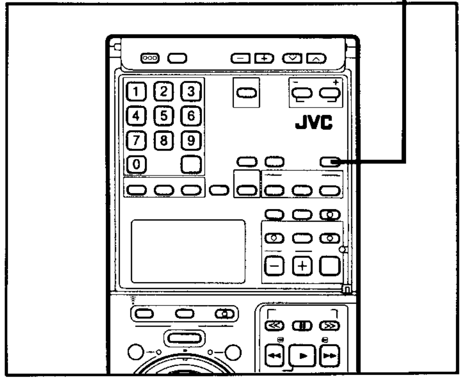
SAP programs can be recorded only on the normal audio track. It is not possible to record any SAP program on the Hi-Fi audio track, regardless of any setting.

USING THIS RECORDER AS AN AUDIO DECK

Audio-only recording

You can record audio only (without recording any video signal) on the normal and Hi-Fi audio tracks. This means you can record a continuous 8-hour FM program onto a single cassette (T-160)

- Connect an audio source (such as an FM tuner) to a pair of AUDIO IN connectors.
- DO NOT connect any equipment to the VIDEO IN connector.
- Obtain "AU" (AUX) in the channel position on the display panel by pressing the numeric key "0", or by either turning the JOG dial or by pressing the CHANNEL buttons until "0" appears, then wait for it to change to "AU".



RECORDING FM SIMULCAST TV PROGRAMS

FM simulcast TV programs can be recorded using an FM stereo tuner. Connect necessary components. (Connect the FM tuner to the AUDIO IN connectors.) Select the TV channel broadcasting the simulcast program with the recorder's channel select button and tune the FM stereo tuner to the station broadcasting the soundtrack for this TV program.

- Press the SIMULCAST buttonso that "SIMUL" appears on the screen and display panel. With this setting, the audio signals from the built-in tuner will be recorded on the normal audio track and the audio signals from the FM stereo tuner will be recorded on the Hi-Fi audio track.

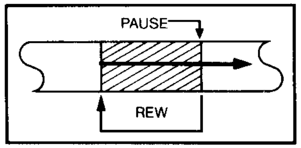
Notes:

- After finishing recording, be sure to return to the Tuner mode by simply pressing the SIMULCAST button so that "SIMUL" disappears.
- While recording simulcast programs, the Hi-Fi sound might be distorted momentarily at switching points between different programs (at the insertion of commercials, for example). This is not due to any defect of the unit.
- Using the "simulcast" recording function, you can record independent audio and video programs. While recording a TV program, record any audio source independently, by connecting an audio component to the AUDIO IN connectors.

CONVENIENT FACILITIES RELATED TO RECORDING

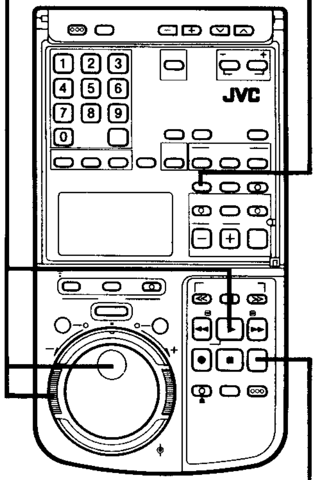
RETAKE FUNCTION

While in the Record-Pause mode, turning the JOG dial or SHUTTLE ring initiates search at the corresponding speed in the corresponding direction. To re-engage the Record-Pause mode, simply release the dial or ring. If you have recorded unnecessary material because of having engaged the Record-Pause mode too late, use this function to return to the position where you want the next recording to start. Then, simply press the PLAY button when you want to re-start recording.



Note:

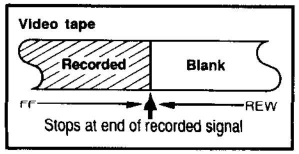
- Rainbow noise may occur in the rewound and re-recorded section.



BLANK SEARCH

When you want to record a new program on a partially recorded tape, use this function to automatically locate the end of a recorded section. Even when a fully recorded tape is used for re-recording new material, this system can be used to detect the end of the newly-recorded material.

- Insert a cassette and press the SKIP/BLANK SEARCH button.
- If a recorded signal is present, the recorder automatically enters the FF mode, and stops automatically around the end of that recorded section. Before starting recording, play back the tape to determine where to start a new recording.
- If the SKIP/BLANK SEARCH button is pressed where no signal is recorded, the recorder automatically enters the REW mode, searches for the end of the preceding recorded segment, and stops.
- When the SKIP/BLANK SEARCH button is pressed, the tape counter is automatically switched to the REMAIN mode and shows the remaining tape time in hours and minutes when the end of the recorded segment is located. To switch back to the realtime counter mode, press the DISPLAY button.



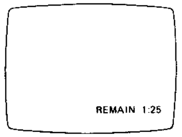
REMAINING TAPE TIME INDICATION

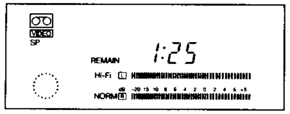
The tape counter can be switched to display the remaining tape time.

- Press the DISPLAY button (or COUNTER/REMAIN/DATE button when using the VCR's front panel control buttons) to obtain the REMAIN tape time indication in hours and minutes on the screen and display panel.

Notes:

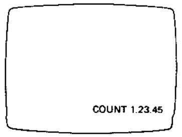
- During recording, the remaining tape length is calculated in reference to the recording mode selected by the SP/EP button; during playback, it is calculated in reference to the recorded mode of the tape being played back (SP or EP).
- The indicated remaining time is approximate.

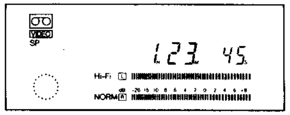




ELAPSED RECORDING TIME INDICATION

When you need to know the exact time of a recording, press the C. RESET button before starting recording or playback. The counter will be reset to "0H 00M 00S" and show the exact elapsed time as the tape runs. Press the DISPLAY button anytime to check the current tape time position on the screen.





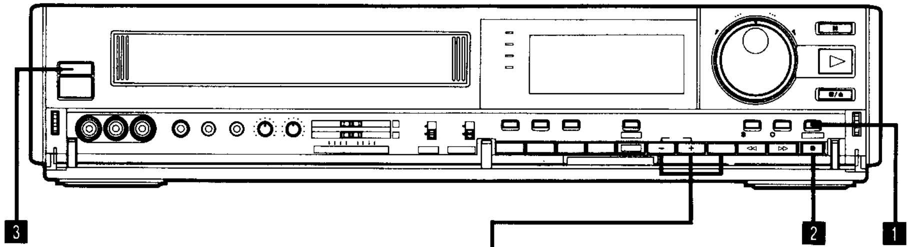
INSTANT TIMER RECORDING

24-HOUR TIMER

The 24-Hour Timer Recording feature allows unattended automatic starting and stopping of the recording of a single program which starts within a 24-hour period.

Preparation

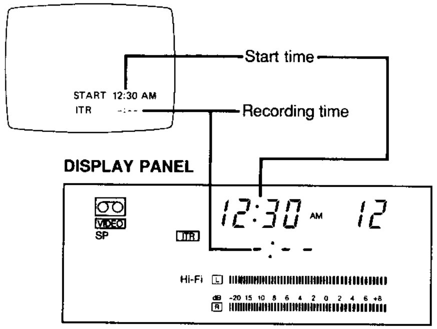
1. Turn on the TV and tune to the video channel (if you wish to set the timer using the TV screen display).
2. Insert a cassette with its safety tab in place. The recorder turns on automatically.
3. Press the TV/VIDEO button to enter the Video mode with the "VIDEO" indicator lighting on the display panel.
4. Select the channel you wish to record from.
5. Select the recording speed, "SP" or "EP", by pressing the SP/EP button.
6. Adjust the Hi-Fi audio recording level.



Setting the timer

1 Press the START button to engage the 24-Hour Instant Timer Set mode. The following appears on the screen with the current time in the START time position.

ON-SCREEN DISPLAY



- Each pressing delays the START time by 30 minutes

2 After reaching the desired START time, press the REC/ITR button the required number of times to set the desired length of recording time.

3 After confirming the START time and recording length, press the POWER button.
- "ITR" lights on the display panel and the 24-Hour Instant Timer Standby mode will automatically engaged.
- If the program has not been correctly preset, the "ITR" indicator will blink for about 10 seconds when the POWER button is pressed. Recheck the programmed data.

For a More Precise Setting of Start Time and Recording Length

Use the SET/SELECT buttons to set the time more precisely.

- After pressintg the START button once, press the SELECT button so that the START time hour blinks. Then press either SET button to enter the Start time hour, and press the SELECT button. Follow the same procedure for entering the minutes.
- The ITR (recording length) hour will start blinking. Turn the JOG dial to enter the required hour, and follow the same procedure to enter the minutes.
- Recording length setting, by using the SET/SELECT buttons, is possible up to a maximum of 8 hours and 59 minutes.

Notes:

- At each step of the timer setting procedure, if no data is entered within 60 seconds, the 24-Hour Timer Set mode is cancelled, and the current time is displayed.
- To cancel the 24-Hour Timer Set mode, press the CANCEL button once or twice depending on the setting status.
- 24-Hour Timer Recording has priority over other timer program settings; therefore, no other programs, set for timer recording, will be recorded until 24-Hour Timer Recording has been executed.
- Even with the power off, pressing the START button displays the 24-Hour Timer settings for about 10 seconds for quick checks.

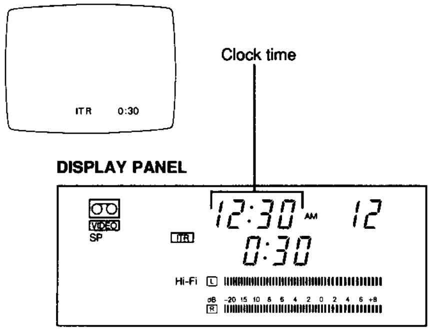
OFF-TIMER

- Start recording as described on page 30.

After you start recording, the recorder can be set to stop automatically after a certain period of time. Use this facility for starting a recording before you go to bed or leave home.

1 Press the REC/ITR button while recording (or twice if in the Stop mode.
- The following indication will appear on the display, to show that the recorder is recording in the Instant Timer Recording mode and power will switch off after 30 minutes.

ON-SCREEN DISPLAY



2 Each time the ITR/REC button is pressed, recording time increases by 30 minutes to a maximum of 4 hours. If the REC/ITR button is pressed again, the Normal Recording mode will be entered.
- For a more precise time setting, use the SELECT /SET buttons to set to the exact time required (possible up to 8 hours and 59 minutes).
  1. After "0:30" has appeared, press the SELECT button.
  2. Press either SET button to enter the required hour , then press the SELECT button.
  3. Press either SET button to enter the required minute, then press the SELECT button so that the minutes stop blinking.

Notes:

- While recording is in progress, the displayed time counts down; when 0:00 is reached, the Record mode is released after 10 seconds and the power is switched off.
- If you want to stop recording after having started recording in the Instant Timer Record mode, press the STOP button.
- If instant timer recording is engaged while the unit is in the Pause mode, the timer will count down normally, but recording will not begin until the PLAY button is pressed.
- When the Instant Timer Record-Pause mode continues for longer than 5 minutes, the mode is released and power is switched off.
- If you want to check the elapsed time (Realtime Counter reading) on the screen while performing Instant Timer Recording, press the COUNTER/REMAIN/DATE button ⑬ or DISPLAY button ⑳ on the remote control to obtain the desired indications (the ITR indication disappears). After about 5 seconds, the indicator will return to the ITR mode and the remaining time indication will reappear automatically.

ON-SCREEN TIMER PROGRAMMING

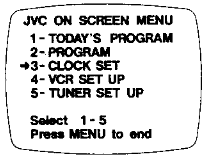
The built-in 1-month/8-event programmable timer permits recording of preset channels on preset days at preset times while you are away.

- To program the timer, use the on-screen menu system.
- The on-screen menu system has two programming modes: TODAY'S PROGRAM, and PROGRAM.
- For recording of a TV program which starts within 24 hours, use the TODAY'S PROGRAM mode. Then you do not have to set the date.
- For recording of any other program including daily and weekly serials, use the PROGRAM mode.
- The PROGRAM REVIEW mode is also available, and this mode is accessible from either the TODAY'S PROGRAM or PROGRAM mode.

Preparation

- First load a cassette with safety tab in place; power will be switched on automatically.
- Turn on the television and set it as required.

Press the MENU button.



```
JVC ON SCREEN MENU
 1-TODAY'S PROGRAM
 2-PROGRAM
→3-CLOCK SET
 4-VCR SET UP
 5-TUNER SET UP

 Select  1-5
 Press MENU to end
```

Guide to messages:

Select 1 — 5: Press numeric key corresponding to the item you wish to select. ("1" for TODAY'S PROGRAM, "2" for PROGRAM.) (The SET/SELECT buttons can also be used; move the cursor arrow with SET and verify with SELECT.)

Press SET/SELECT: Press either SET button to enter data at the blinking position, then press SELECT to verify entry and advance to the next position.

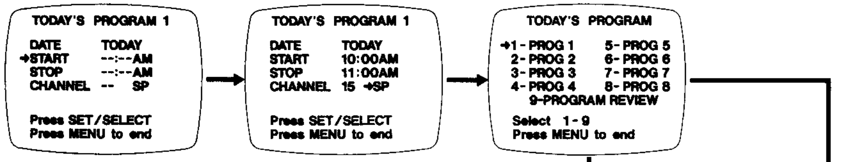
Press MENU to end: Press to quit the current mode. When pressed from an individual program setting page (program number is displayed on top), or from the PROGRAM REVIEW mode, the program list page is opened. When pressed from the program list page, the screen returns to the normal TV picture.

Return to PROGRAM. Press MENU: If a program number which has been already set in the PROGRAM mode is called up in the TODAY'S PROGRAM mode, this message appears, indicating that changing the data is not possible in the TODAY's PROGRAM mode. Engage the PROGRAM mode after returning to the main menu by pressing MENU.

Return to TODAY'S PROGRAM. Press MENU: If a program number which has been already set in the TODAY'S PROGRAM mode is called up in the PROGRAM mode, this message appears, indicating that changing the data is not possible in the PROGRAM mode. Engage the TODAY'S PROGRAM mode after returning to the main menu by pressing MENU.

Press SET to advance: Press SET button to advance program numbers in the PROGRAM REVIEW mode.

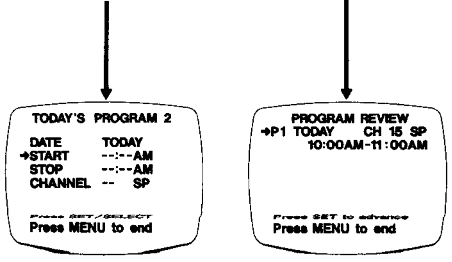
USING "TODAY'S PROGRAM" MODE



```
TODAY'S PROGRAM 1
 DATE      TODAY
→START     --:--AM
 STOP      --:--AM
 CHANNEL   --  SP

 Press SET/SELECT
 Press MENU to end
```

```
TODAY'S PROGRAM 1
 DATE      TODAY
 START     10:00AM
 STOP      11:00AM
 CHANNEL   15 →SP

 Press SET/SELECT
 Press MENU to end
```

```
      TODAY'S PROGRAM
→1-PROG 1    5-PROG 5
 2-PROG 2    6-PROG 6
 3-PROG 3    7-PROG 7
 4-PROG 4    8-PROG 8
   9-PROGRAM REVIEW
 Select  1-9
 Press MENU to end
```



```
TODAY'S PROGRAM 2
 DATE      TODAY
→START     --:--AM
 STOP      --:--AM
 CHANNEL   --  SP

 Press SET/SELECT
 Press MENU to end
```

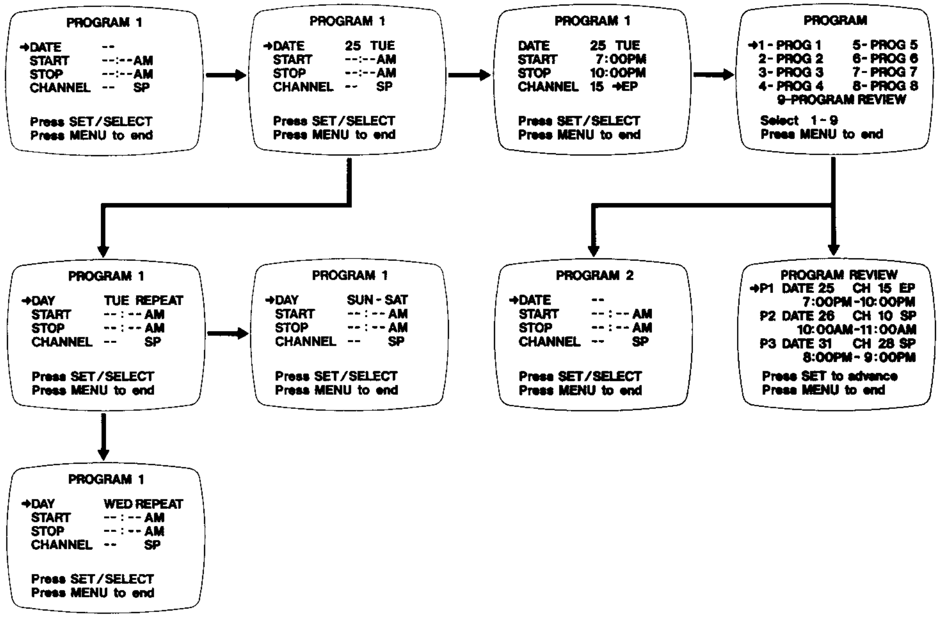
```
    PROGRAM REVIEW
→P1 TODAY     CH 15 SP
      10:00AM-11:00AM




 Press SET to advance
 Press MENU to end
```

Operation tips:

- The lowest-numbered vacant program is always opened automatically.
- In the TODAY'S PROGRAM mode, "TODAY" is always automatically set for "DATE". And the cursor arrow is positioned at "START" when this mode is opened.
- The STOP time must be set within 24 hours of the START time.
- To record an FM simulcast, press the SIMULCAST button ● on the recorder at any time while programming. "SIMUL" will appear on the screen and display panel.
- To record an external source, press either SET button until "AUX" appears for "CHANNEL". Or press numeric key "0" when the cursor arrow is at "CHANNEL"; "AUX" will appear in about 2 seconds.

- When a full set of data has been entered, the screen color changes from blue to green.
- Do not forget to check the recording mode "SP" or "EP", and reset it if necessary.

USING "PROGRAM" MODE



```
PROGRAM 1
→DATE      --
 START     --:--AM
 STOP      --:--AM
 CHANNEL   --   SP

 Press SET/SELECT
 Press MENU to end
```

```
PROGRAM 1
→DATE      25  TUE
 START     --:--AM
 STOP      --:--AM
 CHANNEL   --   SP

 Press SET/SELECT
 Press MENU to end
```

```
PROGRAM 1
 DATE      25  TUE
 START      7:00PM
 STOP      10:00PM
 CHANNEL   15  →EP

 Press SET/SELECT
 Press MENU to end
```

```
        PROGRAM
→1-PROG 1    5-PROG 5
 2-PROG 2    6-PROG 6
 3-PROG 3    7-PROG 7
 4-PROG 4    8-PROG 8
   9-PROGRAM REVIEW
 Select  1-9
 Press MENU to end
```

```
PROGRAM 1
→DAY       TUE REPEAT
 START     --:--AM
 STOP      --:--AM
 CHANNEL   --     SP

 Press SET/SELECT
 Press MENU to end
```

```
PROGRAM 1
→DAY       SUN-SAT
 START     --:--AM
 STOP      --:--AM
 CHANNEL   --     SP

 Press SET/SELECT
 Press MENU to end
```

```
PROGRAM 2
→DATE      --
 START     --:--AM
 STOP      --:--AM
 CHANNEL   --     SP

 Press SET/SELECT
 Press MENU to end
```

```
    PROGRAM REVIEW
→P1 DATE 25   CH 15 EP
       7:00PM-10:00PM
 P2 DATE 26   CH 10 SP
      10:00AM-11:00AM
 P3 DATE 31   CH 28 SP
       8:00PM- 9:00PM
 Press SET to advance
 Press MENU to end
```

```
PROGRAM 1
→DAY       WED REPEAT
 START     --:--AM
 STOP      --:--AM
 CHANNEL   --     SP

 Press SET/SELECT
 Press MENU to end
```

Operation tips:

- The lowest-numbered vacant program is always opened automatically.
- When a date (the day of the month) is entered, the day of the week is automatically set.
- The STOP time must be set within 24 hours of the START time.
- To record a weekly serial, after specifying the date, press the REPEAT button. "DATE" will change to "DAY" and the day of the week and "REPEAT" will appear. You can change the day of the week by pressing SET + button.
- To record a daily serial, after specifying the date, press the REPEAT button twice. "SUN-SAT" will appear for "DAY". By further pressing the REPEAT button, you will get "MON-SAT" and "MON-FRI".
- To check preset programs, press the MENU button from any individual program setting page. A program list page titled PROGRAM will appear. If you want to check a specific program, press the numeric key corresponding to that program number. (If the opened program has been preset in the TODAY'S PROGRAM mode, the message "Return to TODAY'S PROGRAM. Press MENU" will appear.) If you want to check all programs, select "9". The PROGRAM REVIEW mode will be engaged, allowing you to check all programs which have been set both in the TODAY'S PROGRAM and PROGRAM modes.

ATTENTION

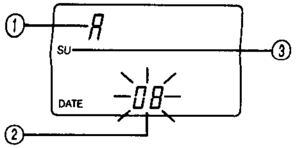
You can use the Jog/Shuttle controls instead of the numeric keys and SET/SELECT buttons. After pressing the MENU button, all setting operations can be done with the Jog/Shuttle controls: JOG dial for setting data (SET) and SHUTTLE ring for verifying entry and advancing to the next position (SELECT).

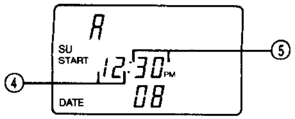
IMPORTANT

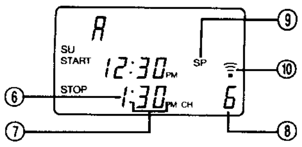
- Be sure to press the TIMER button to engage the Timer Standby mode after having programmed the timer.
- Be sure to check the display panel after pressing the TIMER button.
  - — Is the TIMER indicator lit?
  - — Are the numbers of the preset programs lit?
- For error indications, see page 38.

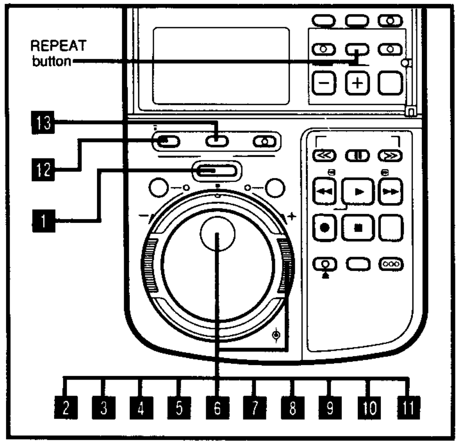
LCD TIMER PROGRAMMING

- The remote control incorporates 4 program memories (A, B, C and D). These are independent of the VCR's timer memories 1 to 8.
- The programmed data is held in memory even after it has been transferred to the recorder.









1 Press the MEMORY PROG. button.
- The LCD screen will be activated for program memory "A" ①.
- To advance to programs B to D, turn the JOG dial.

2 Turn the SHUTTLE ring clockwise.
- The DATE indication for the current day ② will blink.

3 Turn the JOG dial to enter the number for the date on which the recording is to begin. The corresponding day ③ will appear automatically.
- Invalid numbers will be rejected.
- To record a weekly serial, press the REPEAT button. The DATE will disappear and REPEAT, plus the day indication, will appear.
- To record a daily serial, press REPEAT again. "SU ~ SA REPEAT" will appear. By further pressing the REPEAT button, you will obtain "MO ~ SA REPEAT" setting, then a "MO ~ FR REPEAT" setting. If you press REPEAT a fifth time, the display returns to the original day indication.
- In addition, after pressing the REPEAT button once, you can select weekly and daily serial settings by turning the JOG dial.
  The JOG dial sequence is as follows:

→"MO REPEAT" ~ "FR REPEAT" →
"SU ~ SA REPEAT" → "MO ~ SA REPEAT" →
"MO ~ FR REPEAT" →

4 Turn the SHUTTLE ring clockwise.
- The START time hour indication ④ will blink.

5 Turn the JOG dial to enter the START time hour (be sure to select the correct AM/PM setting), then turn the SHUTTLE ring clockwise.
- The START time minute indication ⑤ will blink.

6 Turn the JOG dial to enter the START time minute, then turn the SHUTTLE ring clockwise.
- The STOP time hour indication ⑥ will blink.

7 Turn the JOG dial to enter the STOP time hour (be sure to select the correct AM/PM setting), then turn the SHUTTLE ring clockwise.
- The STOP time minute indication ⑦ will blink.

8 Turn the JOG dial to enter the STOP time minute, then turn the SHUTTLE ring clockwise.
- The channel position ⑧ will blink.

9 Turn the JOG dial to enter the channel number (select "AU" for AUX), then turn the SHUTTLE ring clockwise.
- The recording speed ⑨ will blink.

10 Turn the JOG dial to enter the recording speed.
- SP for Standard Play, EP for Extended Play.

11 Turn the SHUTTLE ring clockwise.
- The transfer-ready mark ⑩ will appear and blink.
- If correction is required, turn the SHUTTLE ring counterclockwise until the intended position blinks and enter new data with the JOG dial.
- Now you can advance to the next program, if necessary, by turning the JOG dial.
- After all necessary programs have been preset, proceed to the next step.

12 Direct the remote control to the recorder's Remote Sensor window and press the TRANS button.
- The programmed data will be loaded in one of the VCR's memories (1 – 8), the vacant one of the smallest number.
- When the programmed data is successfully transferred to the VCR's memories, a steady 2-second beep will be heard with the entered program appearing on the display panel for 5 seconds. Otherwise, when data transfer is not successful, two short, intermittent beeps will be heard with the clock display blinking for 5 seconds.
- Invalid channel numbers will not be rejected when entered in the remote control's memory data. However, they will be rejected when transferred, and the clock display on the display panel will blink. Recheck the programmed data.
- If all program memories are full, transmission will not take place.
- When this happens, check the VCR's memories on-screen and cancel unnecessary programs. For this purpose, use the on-screen Menu system.
- After having cleared the VCR's program memory, transfer the data once again.

13 Press the TIMER button.
- The TIMER indicator on the display panel will light. (For error indications, see page 38.)

IMPORTANT INFORMATION ON TIMER RECORDING

CHECKING AND CANCELLING/RE-PROGRAMMING PROGRAMS

Since executed programs are automatically cleared (except those for daily and weekly serials), there may be rare cases that the entire program memory is full. If this should happen, when you open either the TODAY'S PROGRAM or PROGRAM mode, program number "1" is displayed, instead of the lowest-numbered vacant program. In such cases, check the preset programs and cancel some or re-program the data.

1. Press the MENU button again to obtain the program list page.
2. Press numeric key "9" to call the PROGRAM REVIEW mode.
3. Check all preset programs and determine the number of the program to be cancelled.
4. Press the MENU button to return to the program list page.
5. Select the program to be cancelled or re-programmed.
6. To cancel, press the CANCEL button. To re-program the data, enter new data with the SET/SELECT buttons or JOG/SHUTTLE controls.

Note:
- If you call up a programming display on the screen while timer recording is in progress, the indications may not be correct. If this should happen, press the MENU button to return to the main menu screen, and then call up a programming display.

VARIETY OF DAY SETTING POSSIBILITIES

No.	Setting	Indication
1	One day within one month	Date + Day
2	Weekly serial recording	Day + REPEAT
3	Daily serial recording from Sunday through Saturday	SUN — SAT (LCD screen and display panel indication — SU MO TU WE TH FR SA)
4	Daily serial recording from Monday through Saturday	MON — SAT (LCD screen and display panel indication — MO TU WE TH FR SA)
5	Daily serial recording from Monday through Friday	MON — FRI (LCD screen and display panel indication — MO TU WE TH FR)

ERROR INDICATIONS

- When the TIMER button is pressed with a cassette loaded and the timer correctly programmed, the TIMER indicator on the display will light with the corresponding preset program number(s) also lighting and the power is turned off.
- When you have preset several programs at a time, confirm that all the preset program numbers light together with the TIMER indicator when the TIMER button is pressed. The program whose number does not light has not been correctly preset. Recheck the programmed data.
- If all programs have been wrongly preset, the TIMER indicator will blink for about 10 seconds when the TIMER button is pressed, and then the Timer Standby mode will be cancelled.
- If the TIMER button is pressed when a cassette is not loaded, the TIMER and ▭ indicators will continue blinking. Also a programmed timer recording will not be executed, even if you insert a cassette after the start time has passed.
- If a cassette with its safety tab removed has been loaded, it will be ejected automatically when the TIMER button is pressed. The TIMER and ▭ indicators will continue blinking.
- As long as the TIMER button is engaged with the TIMER indicator lit, unloading of the cassette is not possible.

TIMER OPERATION

- Tape loading starts 20 seconds before the preset start time and the recording start signal is triggered 2 seconds before the preset time so that recording starts exactly at the preset time.
- During timer recording, the number of the program that is presently operating will be blinking.
- After timer recording, the power is switched off and the auto-rewind mechanism does not function. If the end of the tape is reached during timer recording, the cassette is automatically ejected and then the power is switched off with the TIMER indicator blinking.
- If a power failure in excess of 60 seconds should occur, not only time-keeping stops, but also all the preset data will be cancelled. (A blinking SU 12:00 AM indicates this after power has been reapplied.) In such cases, first correct the time indication and then re-enter the programming data.

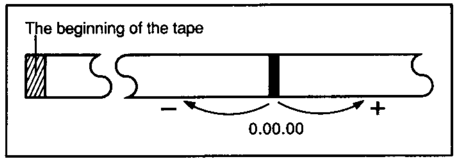
CONVENIENT TAPE ACCESS FUNCTIONS

REALTIME TAPE COUNTER

Unlike usual tape counters which show tape locations in numbers, this realtime tape counter shows tape time precisely in hours, minutes and seconds in all modes. The counter resets automatically when a cassette is inserted.

REALTIME SEARCH

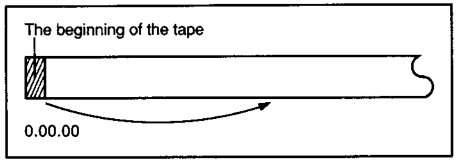
To locate any point on the tape a specified time away from the current position in either direction.



1. Press the remote control's GO-TO button while in the Play, Still or Stop mode.
   - The screen will show "GO-TO –.–.–" if the recorder did not detect the leader tape when the cassette was loaded; it will show the current tape counter reading if the leader tape has been detected. The corresponding indication will appear on the display panel.
   - "GO-TO 0.02.34" (for example) will appear if the recorder has already detected the leader tape, to show the current tape counter reading in terms of realtime from the tape's beginning.
2. Press the SET "–" button (for reverse direction: "–" appears in front of the first "0") or press the SET "+" button (for forward direction: no indication).
3. Specify the time to the point to be located, by using the numeric keys.
   - Always key in a full number.
4. Press the PLAY or STOP button (PAUSE/STILL button, if either the Play or Still mode is already engaged).
   - Depending on the situation, search will take place in either the Shuttle Search mode or in the Fast Forward or Rewind mode. After the specified point is reached, playback starts automatically, the tape stops automatically or enters the Still mode, depending on the command.

REALTIME GO-TO

To locate any point on the tape a specified time away from the beginning of the tape.



The procedure is the same as for the Realtime Search except step 2. Specifying the direction is not necessary.

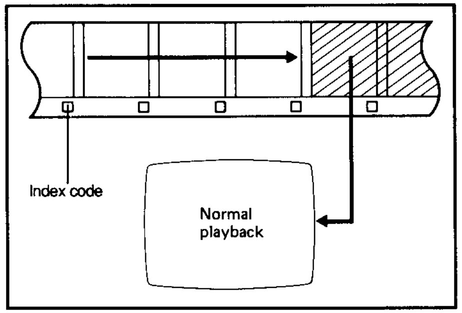
Notes:
- Each step in the operation procedure must be followed by the next within 60 seconds, otherwise the Go-To or Search mode will be cancelled.
- Use of the other control buttons while in the Go-To or Search mode cancels that mode.
- If the specified time exceeds the tape length, the tape fast forwards to the end and then rewinds to the beginning and stops or enters the Play mode.

COUNTER MEMORY FUNCTION

1. Press the C. RESET button at a point which you may wish to locate later.
   - The counter will read "0H 00M 00S".
2. Press the C. MEMORY button. M will appear on the display panel and "MEMORY ON" will appear on the screen.
3. Press the REW (or FF) button when you need to return to the designated point.
   - The tape will rewind (or fast forward) and stop at about "0H 00M 00S" automatically.
   - The Counter Memory function can also be used in conjunction with the Memory Play function (page 29).

INDEX SEARCH

The Index Search function gives you automatic access to the beginning of individual recordings on the cassette tape. An index code is automatically placed on the tape's control track each time a recording is begun. You can access any one of up to 99 of these indexed segments in either the forward or reverse direction.



1. Press the INDEX button while in the Play or Stop mode.
   - The channel display of the display panel will change to the Index Search mode and "INDX" will light. "INDEX" will appear on the screen.
2. Specify the index number (1-99) using the numeric keys within 10 seconds.
   - The specified number will appear in the display panel and on the screen.
3. Press either the FF or REW button.
   - The tape will move and the index numbers count down to 0, where normal playback will start.
   - If the INDEX button was pressed in the Play mode, the screen shows search pictures; if the button was pressed in the Stop mode, the index codes are detected in the Rewind or Fast-Forward mode.

Notes:
- To cancel the Index Search mode before completion, press the PLAY or STOP button.
- If the end of the tape is reached while still in the Index Search mode, the mode is cancelled and the tape rewound.

MANUAL INDEX MARK/ERASE

Index codes are automatically placed at the beginning of recordings which are started from the Stop or Timer Standby mode. You can use the MARK button to add extra codes, and the ERASE button to erase codes. In neither case is there any effect on the audio or video recordings on the tape.

Erase

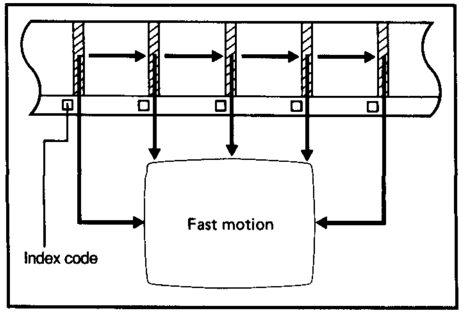
In the Play or Still mode, press ERASE button to erase the next index code. The tape is automatically fast-forwarded and when an index code is detected, it will be erased automatically. "ERASE" (on the screen) and "INDX" (on the display panel) remains lit during the searching process and blinks during the erasing process.

Mark

In the Play or Record mode, press MARK button once to put an index code onto the tape. "MARK" (on the screen) and "INDX" (on the display panel) appear and blink during the marking process.

Notes:
- Index codes cannot be added or erased on a tape with its safety tab removed.
- The Erase mode is cancelled either after one index code has been erased or the Play mode is cancelled.
- Changing the index codes in the vicinity of switching points between SP and EP recordings will distort the pictures.

INTRO SEARCH



The Intro Search function lets you visually check the contents of each recording by playing back in fast motion a short segment of a program each time an index code is detected.

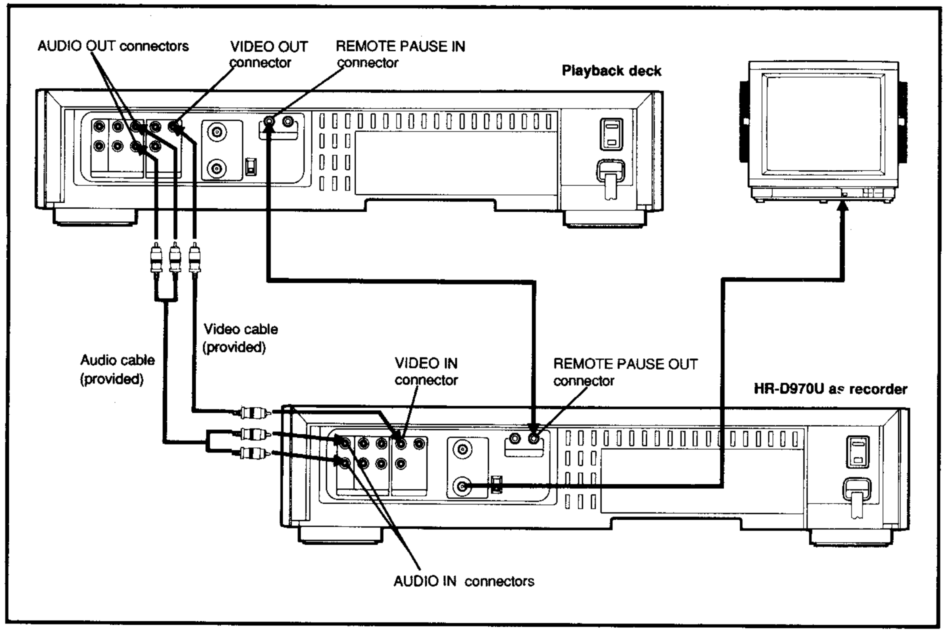
1. Press the INTRO button while in the Play or Stop mode.
   - "INDEX" will appear on the screen. (The INDX indicator on the display panel will light.)
2. Press the FF or REW button within 2 seconds.
   - The Intro Search will start in the corresponding direction.
   - Each time an index code is detected, the corresponding part is played back at the search speed (7 times normal in SP and 21 times normal in EP mode) for about 5 seconds.
3. When you find the section you want to view, simply press the PLAY button.
   - Normal playback will start.

TAPE-TO-TAPE EDITING

Tape-to-tape editing is possible using a 2nd video deck or a VideoMovie camcorder (with playback facility). Compact VideoMovie recordings can also be edited just like regular VHS cassettes through use of a cassette adapter.

EDITING TO OR FROM ANOTHER VIDEO RECORDER

This video recorder is specially designed to be used as the recording deck in an editing suite, though it can also be used as the source player. If the source player is equipped with a preroll-capable REMOTE PAUSE terminal, accurate preroll assemble and insert editing are possible. Either set of input connectors (front or rear) can be used to connect a 2nd deck as the source player. If connections are made to both sets, the front set has priority. Therefore, it is recommended that the rear set be used for permanent connection of a VCR, and the front set, for connection of a VideoMovie as occasion requires.



Using a 2nd video deck as the source player

- Connect the player's VIDEO OUT and AUDIO OUT to the recorder's VIDEO IN and AUDIO IN.
- Connect the recorder's REMOTE PAUSE OUT to the player's REMOTE PAUSE, using a mini-plug cable.
- Set the EDIT/PREROLL switch to ON. (In this case, this switch functions as a PREROLL switch.) For preroll assemble and insert editing procedures, see pages 43 and 44.

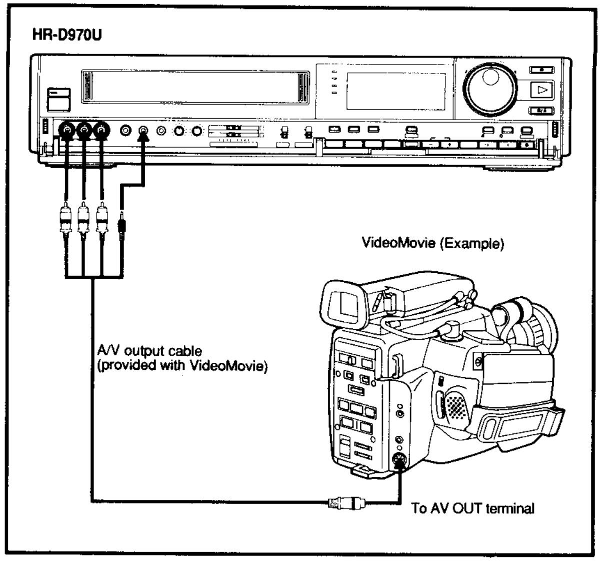
Using a 2nd video deck as the recorder

If you use this recorder as a source player, pay attention to the following points:

- Set the EDIT/PREROLL switch to ON. (In this case, this switch functions as an EDIT switch to make output video signals closer to the original.)
- If you do not want the On-Screen mode indications to be recorded on the dubbed tape, set "ON SCREEN" on the VCR SET UP menu to "OFF".

E-E (Electric-Electric) monitoring

The TV MONITOR button serves as an E-E monitor button when editing. While playing back a tape on the recorder, you can also check the contents of the player's tape by pressing the TV MONITOR button without stopping the recorder's tape. To return to the recorder's tape, press the TV MONITOR button again.



EDITING FROM A VIDEOMOVIE CAMCORDER

- Connect the VideoMovie's AV OUT connector to the recorder's VIDEO IN and AUDIO IN connectors. (With monaural VideoMovie models, use the AUDIO L connector.)
- Connect the mini-plug of the AV output cable to the REMOTE PAUSE IN terminal of the recorder.
- If the VideoMovie is equipped with a Master Edit Control system, you can control the recorder with the VideoMovie's controls for making edits free of transition-point gaps and distortion. Refer to the VideoMovie's instruction manual for detailed operating procedures for editing.
- With this connection, you can also use the VideoMovie as a video camera for direct recording onto the recorder's tape. Put the recorder in the Record-Pause mode and operate the VideoMovie's start/stop trigger to start and pause recording. (For direct recording with a separate video camera, a camera adapter is necessary.)

AUDIO DUBBING

Audio dubbing means recording a new soundtrack on a pre-recorded tape. In other words, the previously recorded sound is erased and replaced with a new soundtrack. **Audio dubbing is applicable only to the longitudinal audio track (normal audio).** Therefore, a dubbed narration can be heard together with the original Hi-Fi sound.

Procedure

1. Switch on the TV receiver.
   - Set the TV receiver in the appropriate mode.
2. Load a pre-recorded cassette. Power will be switched on automatically.
3. Connect a microphone or an audio source to the MIC jack or the AUDIO IN connectors respectively.
   - With both microphone and audio source connected, mixed sound is recorded.
4. Engage the "AUX" mode ("AU" in the channel display).
   - If you record sound only from the microphone, the source equipment connected to the AUDIO IN connectors should be off.
5. Press the PLAY button to start playback and then search for the point from which you wish to start audio dubbing.
6. Engage the Still mode at the start point of audio dubbing.
7. Press the AUDIO DUB button.
8. Press the PLAY button.
   - Audio dubbing will start.

Notes:

- It is recommended that you use a lower-impedance microphone.
- If a stereo source is connected to the AUDIO IN connectors, the mixed L and R sound is recorded.
- If whistling or howling is heard during audio dubbing, reduce the TV volume or move the microphone farther away from the TV. Recording is being performed even if sound is not heard from the TV receiver. If you want to monitor the sound being recorded, connect headphones to the PHONES jack.

PREROLL EDITING

Since this recorder comes equipped with a REMOTE PAUSE OUT terminal, synchronized preroll editing is possible for high-quality editing results. Preroll editing is possible with a preroll time of about 5 seconds when this recorder is used as the recorder and a second deck with a preroll-capable REMOTE PAUSE terminal is used as the player.

Connection

- Connect two decks as illustrated on page 41.
- Connect this recorder's REMOTE PAUSE OUT terminal to the second deck's (playback deck) REMOTE PAUSE terminal using a mini-plug cable.

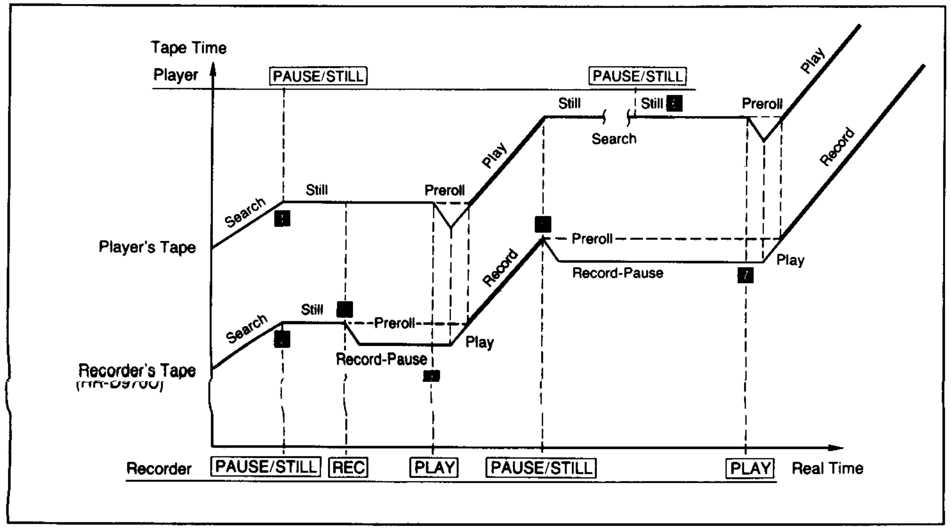
PREROLL ASSEMBLE EDITING

- **Set the EDIT/PREROLL switch ㉛to ON.**

1. Play back the source tape and engage the Still mode at the edit-in point. (Player)
2. Play back the recording tape and engage the Still mode at the edit-in point. (HR-D970U — Recorder)
   - Use the SHUTTLE ring for search. Releasing it engages the Still mode.
3. Press the REC/ITR button of the recorder.
   - The recorder will preroll for about 5 seconds, after which it enters the Record-Pause mode. The monitor screen will show the still picture of the source tape.
4. Press the PLAY button of the recorder.
   - The player will preroll for about 5 seconds while the recorder is standing by with its REC indicator blinking. Then the prerolled section will be played back on both decks and editing will start at the specified edit-in point.
5. Press the PAUSE/STILL button of the recorder to stop editing.
   - The recorder will preroll and stop in the Record-Pause mode.
   - The player will enter the Still mode.
6. Search for the edit-in point of a next edit on the source tape and engage the Still mode. (Player)
7. Press the PLAY button of the recorder.
   - After prerolling, editing will start at the specified edit-in point.
8. Press the PAUSE/STILL button of the recorder to stop editing.
9. To continue assemble editing, repeat steps 6 through 8.
10. To end preroll editing, first press the player's STOP button and then the recorder's STOP button.

Note:

- A preroll command is given to the player by pressing the recorder's PLAY button while in the Record-Pause mode. This function is available only with the first pressing of the button in the corresponding status. Therefore, do not press it until the player stands by at the edit-in point in the Still mode.



PREROLL INSERT EDITING

Insert editing means recording a new scene into a section of pre-recorded tape so that a part of the original recording can be replaced with a new sequence without excessive picture distortion at edit-in and edit-out points. Thanks to the flying erase head, clean edits can be obtained.

> **Important**
> Since video and hi-fi audio signals are recorded simultaneously, both are replaced with new recordings simultaneously. The normal audio soundtrack remains unchanged. However, by using the insert editing and audio dubbing functions together, all signals can be replaced simultaneously.

- **Set the EDIT/PREROLL switch ㉛to ON.**

1. Play back the source tape and engage the Still mode at the edit-in point. (Player)
2. Play back the recording tape and engage the Still mode at the edit-in point (the beginning of the section to be replaced). (HR-D970U — Recorder)
   - Use the SHUTTLE ring for search. Releasing it engages the Still mode.
3. Press the INSERT button of the recorder.
   - The recorder will preroll for about 5 seconds, after which it enters the Insert Standby mode. The monitor screen will show the still picture of the source tape.
   - If the normal audio track is to be replaced, press the A. DUB button after completion of preroll.
4. Press the PLAY button of the recorder.
   - The player will preroll for about 5 seconds while the recorder is standing by with its REC indicator blinking. Then the prerolled section will be played back on both decks and insert editing will start at the specified edit-in point.
5. Press the PAUSE/STILL button of the recorder to stop insert editing.
   - The recorder will preroll and stop in the Record-Pause mode.
   - The player will enter the Still mode.
6. To end preroll insert editing, first press the player's STOP button and then the recorder's STOP button.

Notes:

- Do not use the STOP button to stop insert editing. If you press the STOP button, the Insert Edit mode will be cancelled and distortion will result at the edit-out point.
- For automatic stop of insert editing, you can specify the edit-out point on the recording tape in advance. For this purpose, first locate the edit-out point (the end of the section to be replaced) and press the C. RESET button. Then rewind to the edit-in point and start insert editing as described above. When the counter "zero" reading is reached, insert editing will stop automatically. The recorder will enter the Play mode and the player will enter the Still mode.
- The recording mode (SP or EP) is automatically determined by the previous recording onto which the new segment is inserted, regardless of the setting of the SP/EP button.
- If the recording mode changes from SP to EP, or vice versa, in a single edit, the inserted picture will be distorted at the switching point.
- If there is a non-recorded section on the recording tape, the Insert Edit mode will be cancelled automatically, and the recorder will switch to the Play mode while the player will enter the Still mode.

FADE-IN/FADE-OUT

To give a professional touch to your edited tape, this recorder has a built-in white fader function.

Fade-in

- To start an edit with fade-in, press the VIDEO FADER button ㉔, instead of the PLAY button, to start editing from the Record-Pause mode.
- The edit will start with a blank white screen and fade in to normal in about 5 seconds.
- Keeping the VIDEO FADER button depressed does not extend the fade-in time.

Fade-out

- To end an edit with fade-out, press the VIDEO FADER button, instead of the PAUSE/STILL button, to stop editing.
- The picture will fade out in about 5 seconds, and the recorder will enter the Record-Pause mode.

> **Notes:**
> - The audio does not fade in or out with the video.
> - The VIDEO FADER button has no effect on the playback picture or the TV picture.

DUET EDITING

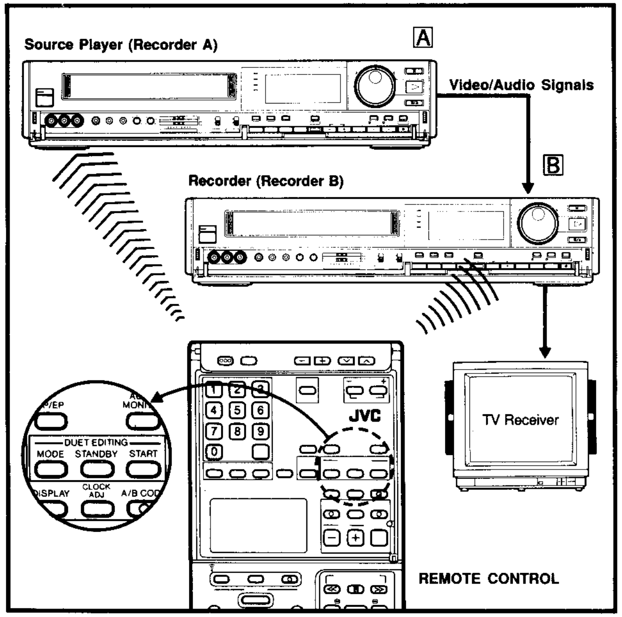
Designed specifically to simplify editing operations, the Duet Editing function delivers separate commands to two recorders simultaneously via a single remote control, taking advantage of the A/B code system. (JVC dedicated models only.)

Preparations

- Connect two recorders as described in "TAPE-TO-TAPE EDITING" on page 41. (REMOTE PAUSE connection is not necessary.)
- Set one recorder to respond to A code signals, the other, to respond to B code signals. (See page 11.)
- Place the two recorders side by side.

Notes:

- JVC video recorders with infrared remote control units which are not equipped with an A/B code select button or switch are designed to receive A code signals. Therefore, Duet Editing is possible with most JVC decks if this recorder is set to respond to B code signals.
- It is not possible to perform Duet Editing unless the remote control's clock has previously been set.



OPERATION

Remote Control	Recorder A (Source player)	Recorder B (recorder)
	Load a recorded tape.	Load a blank tape.
1. Press MODE. "EDIT $\boxed{A}$ → $\boxed{B}$" appears on LCD.		
2. Press STANDBY.	Enters STILL mode.	Enters RECORD-PAUSE mode.
3. Search for an edit-in point on the source tape. Press PAUSE/STILL.	Functions as commanded. (In this state, only recorder A responds to the remote control's commands.)	Remains in RECORD-PAUSE mode.
4. Press START.	Enters PLAY mode.	Enters RECORD mode.
5. Press PAUSE/STILL.	Enters STILL mode.	Enters RECORD-PAUSE mode.
6. Repeat steps 3, 4 and 5 to continue editing.		

Notes:

- You can use Recorder B (the recorder set to respond to B code signals) as source player and Recorder A as a recorder. In this case, press the A/B CODE button after step 1 to obtain "EDIT $\boxed{B}$ → $\boxed{A}$" indication.
- To cancel the Duet Edit mode and return to normal remote control functions, press the MODE button so that the EDIT indication disappears.
- When the START button is pressed, the recorder takes a few seconds before actual editing starts due to the automatic backspace editing system. At the same time the START button is pressed, the player starts playback from the specified edit-in point. Therefore, it is recommended that you specify a point slightly before the intended edit-in point in step 3 for more accurate editing. This also ensures that the picture of the resulting edit will be more stable.
- Preroll editing does not take place with Duet Editing.

IN CASE OF DIFFICULTY

POWER AND TAPE TRANSPORT PROBLEMS

Symptoms	Check points
No power is applied to the recorder.	• Is the power cord disconnected? — Connect it.
Clock is functioning properly, but the recorder cannot be powered.	• Is the TIMER indicator lit on the display panel? — Press the TIMER button to turn off the indicator.
Tape does not run during recording.	• Is the PAUSE/STILL indicator lit? — Press the PLAY button
Tape stops in the Rewind or Fast-Forward mode.	• Is the C. MEMORY button pressed? — Press to make $\boxed{M}$ disappear from the display panel.
Tape will not rewind or fast forward.	• Is the tape already fully rewound or fast forwarded? — Check the cassette.

RECORDING PROBLEMS

Symptoms	Check points
Recording cannot be started.	• Is a cassette loaded? • Is the safety tab on the cassette removed? — Reseal the slot with cellophane tape.
TV broadcasts cannot be recorded	• Has "AUX" been selected? — Set to the desired channel.
Camera recording is not possible.	• Are the camera and the camera adapter correctly connected? • Is the power switch of the camera adapter set to ON? • Has "AUX" been selected? — Set to "AUX".
Timer recording is not possible.	• Have you set the clock correctly and programmed the timer correctly? — Check once again. • Is the TIMER indicator lit on the display panel? — If not, press the TIMER button to light the indicator.

PLAYBACK PROBLEMS

Symptoms	Check points
Playback picture does not appear while the tape is running.	• If you are using RF OUT connection, is the TV receiver's channel selector set to the correct video channel? — Set it to the RF converter channel. (See page 16.) • If you are using AV connection, is the television engaged in the AV mode? — Operate the television's mode.
Playback is repeated.	• Is "REPEAT on the VCR SET UP menu set to either "FULL" or "SEGMENT"? — Set it to "NO".
Noise appears during search and still pictures.	• This is normal.
Noise appears during normal playback.	• Is the automatic tracking mode engaged? — Engage the manual tracking mode. (See page 26.)
Noise appears during slow and still playback.	• Is the automatic tracking mode engaged? — Engage the manual tracking mode. (See page 26.)
Playback picture is blurred or interrupted while TV broadcasts are clear.	• Video heads may be dirty. — Head cleaning is necessary. Consult your JVC dealer.

Continued on next page . . .

HI-FI AUDIO PROBLEMS

Symptoms	Check points
Breaks are noticeable in Hi-Fi audio reproduction.	• Is the automatic tracking mode engaged? — Engage the manual tracking mode. (See page 26.)
Soundtrack on the Hi-Fi audio track cannot be reproduced.	• Is "NORM" on the display panel? — Press the AUDIO MONITOR button to obtain "Hi-Fi".
Audio level indicators do not function.	• Is "LEVEL INDICATOR" set to OFF on the VCR SET UP menu? — Set it to ON.

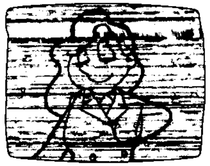
OTHERS

Symptoms	Check points
Whistling or howling is heard from TV during recording.	• Move camera's microphone away from TV or reduce TV sound volume.
Clock setting is not possible.	• Is the TIMER indicator lit on the display panel? — Press the TIMER button to turn off the indicator.
Some channels are skipped over when scanning channels.	• Those channels are preset to be skipped over. If you need them, restore them. (See page 23.)
Channel cannot be switched.	• Is recording in progress? — Press the PAUSE/STILL button, select a desired channel and press the PLAY button.
Snowy picture on screen when viewing TV programs while recording another program.	• Is the VIDEO indicator on? — Press the TV/VIDEO button so that the indicator extinguishes. (With AV connection with the RF output channel select switch set to OFF, the indicator and the TV/VIDEO button have no effect.)
Remote control does not function.	• Batteries are discharged. — Replace with new ones. • Is the A/B CODE button set for the proper code for the recorder being operated? — Press the A/B CODE button for the correct setting.
Index Search does not function properly.	• Adjacent index codes may be too close to each other. — Erase some index codes and mark new ones, if necessary, with sufficient distance between two index codes.
Operating sound is audible during recording, playback, rewind, fast forward, etc.	• This is normal because VCRs incorporate motors, rotary head assembly, etc. for their operation.

This recorder contains microcomputers. External electronic noise or interference could cause malfunctioning. In such cases, switch the power off and unplug the power cord. Then plug it in again and switch on. Take out the cassette. After checking the cassette, operate the unit as usual.

HEAD CLEANING

- Picture playback may become blurred or interrupted while the TV programme received is clear. This does not mean that the recorded programme has been erased.



- Dirt accumulated on the video heads after long periods of use causes such troubles. In this case, head cleaning requiring highly technical care is necessary.
- *For head cleaning, consult the nearest JVC dealer.*

SPECIFICATIONS

GENERAL

Power requirement	: AC 120 V∿, 60 Hz
Power consumption	: 23W
Temperature	
Operating	: 5°C to 40°C (41°F to 104°F)
Storage	: – 20°C to 60°C (– 4°F to 140°F)
Humidity	
Operating	: 35% to 80%
Storage	: 5% to 80%
Operating position	: Horizontal only
Dimensions (WxHxD)	: 449 x 94 x 338 mm (17-11/16" x 3-3/4" x 13-5/16")
Weight	: 5.7 kg (12.6 lbs)
Format	: VHS NTSC standard
Tape width	: 12.65 mm
Tape speed (SP)	: 33.35 mm/sec (1-5/16 ips)
(EP)	: 11.12 mm/sec (7/16 ips)
Maximum recording time (SP)	: 160 min. with T-160 video cassette
(EP)	: 480 min. with T-160 video cassette

VIDEO

Signal system	: NTSC-type color signal and EIA monochrome signal, 525 lines/60 fields
Recording system	: Rotary two-head helical scan system with slant double-azimuth combination video heads
Input	: 0.5 to 2.0 Vp-p, 75 ohms, unbalanced
Output	: 1.0 Vp-p, 75 ohms, unbalanced
Signal-to-noise ratio	: 45 dB (Rohde & Schwarz noise meter) with PICTURE SHARPNESS control at center position
Horizontal resolution	: 240 lines

AUDIO

Input	: – 8 dBs, more than 50 k-ohms, unbalanced
Output	: – 6 dBs, less than 1 k-ohm, unbalanced (100 k-ohms, load)

NORMAL AUDIO

Recording system	: Longitudinal track
No. of audio channels	: 1 normal audio channel
Frequency response	: 70 Hz to 10,000 Hz

HI-FI AUDIO

Recording system	: Deep-layer recording system conforming to stereo Hi-Fi VHS standard
No. of audio channels	: 2 Hi-Fi audio channels
Frequency response	: 20 Hz to 20,000 Hz
Dynamic range	: More than 90 dB
Wow and flutter	: Less than 0.005% WRMS

TUNER

Tuning system	: Frequency synthesized tuner
Channel coverage	
(VHF)	: Channels 2 – 13
(UHF)	: Channels 14 – 69
(CATV)	: 113 Channels
RF output	: Channel 3, 4 or OFF (switchable; preset to Channel 3 when shipped) 75 ohms, unbalanced

TIMER

Clock reference	: Quartz-crystal
Program capacity	: 1-month programmable timer/ 8-programs
Memory backup time	: 60 sec.

ACCESSORIES

Provided accessories	: Antenna cable (F-type), Matching transformer, Infrared remote control unit, "AA" battery x 4, Audio cable, Video cable

E. & O.E. Specifications shown are for SP mode unless otherwise specified.
Design and specifications subject to change without notice.

SECTION 1
DISASSEMBLY AND MECHANISM ADJUSTMENTS

1.1 DISASSEMBLY

1.1.1 Top cover

1. Refer to Fig. 1-1-1 and set for the EJECT (Stop) mode and disconnect VCR from AC power.
2. Take out 4 screws Ⓐ for the side panel (L) and (R) (HR-D970USA/CANADA), slide in direction of arrows and remove them.
3. Tilt up the rear and of the top cover in direction arrow and lift away.

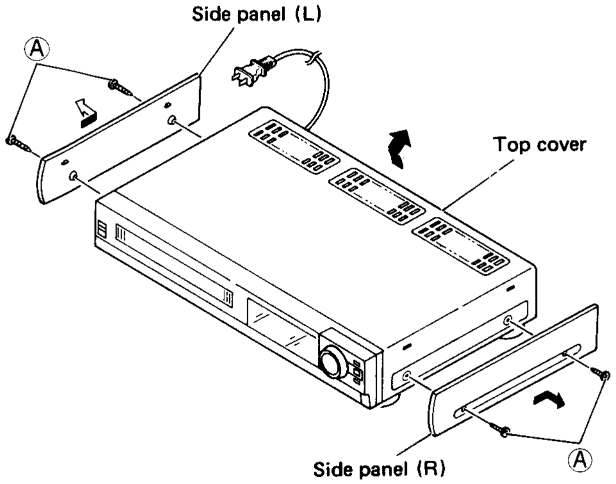


Fig. 1-1-1

1.1.2 Front panel assembly

1. Remove the top cover.
2. Carefully disengage 3 tabs Ⓑ of the front panel assembly from the upper side of the chassis.
3. Refer to Fig. 1-1-2 and pull the front panel assembly forward you to disengage 3 tabs Ⓒ of the front panel assembly from the bottom side of the chassis, then remove the front panel assembly.

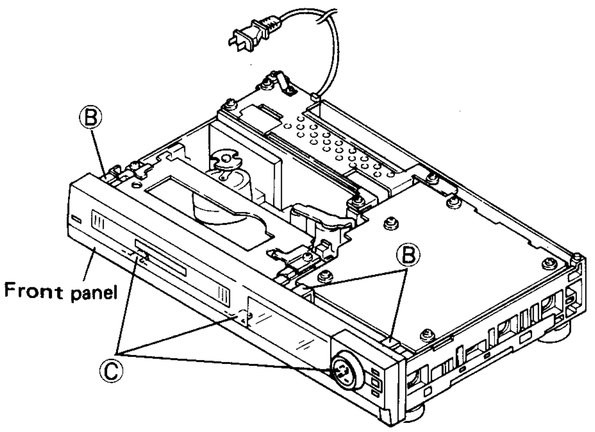


Fig. 1-1-2

1.1.3 Bottom cover

1. Remove the top cover.
2. Refer to Fig. 1-1-3 and take out 5 screws Ⓓ and disengage 4 tabs Ⓔ from the bottom of the chassis of the VCR.
3. Lift the rear of bottom cover to clear chassis projections and slide bottom cover towards back of chassis, to disengage 3 tabs Ⓕ from slots in chassis. Remove bottom cover in direction of arrow. Note position of tabs, because they must mate with slots in chassis when reinstalling bottom cover.

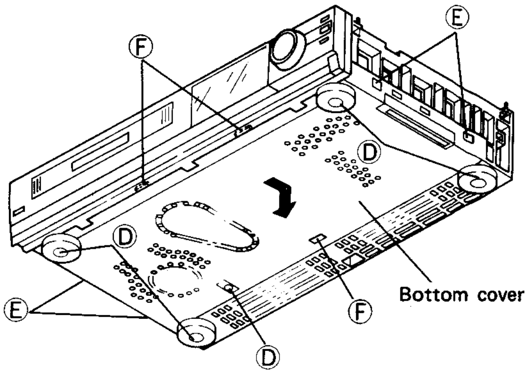


Fig. 1-1-3

1.1.4 Main board assembly

1. Remove the top cover.
2. Refer to Fig. 1-1-4 and take out 5 screws Ⓖ from main board assembly.
3. Remove the main board assembly in the upward direction.

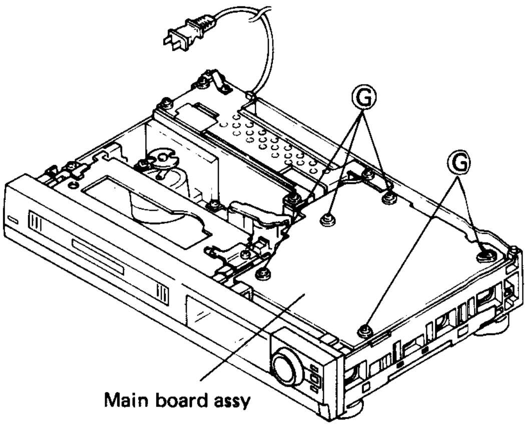


Fig. 1-1-4

1.1.5 Cassette housing

1. Remove the top cover and main board assembly.
2. Refer to Fig. 1-1-5.
   Take out 4 screws Ⓗ that secure the cassette housing.
3. Remove the front panel assembly as shown in Sec. 1.1.2 where it does not interfere with removing the cassette housing.
4. Refer to Fig. 1-1-6, pull the cassette bousing forward direction of arrow first, remove the cassette housing in the upward direction.

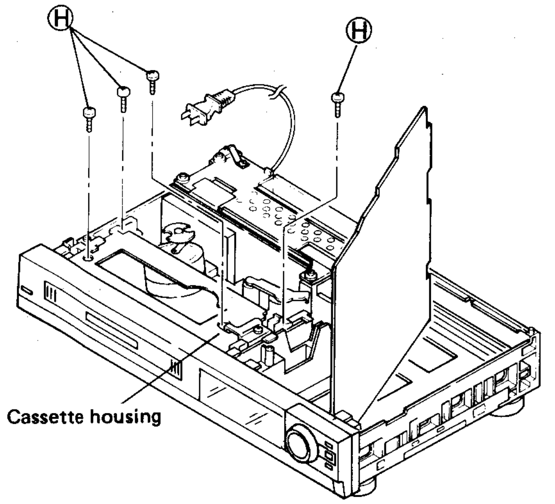

Ⓗ
Ⓗ
Cassette housing

Fig. 1-1-5

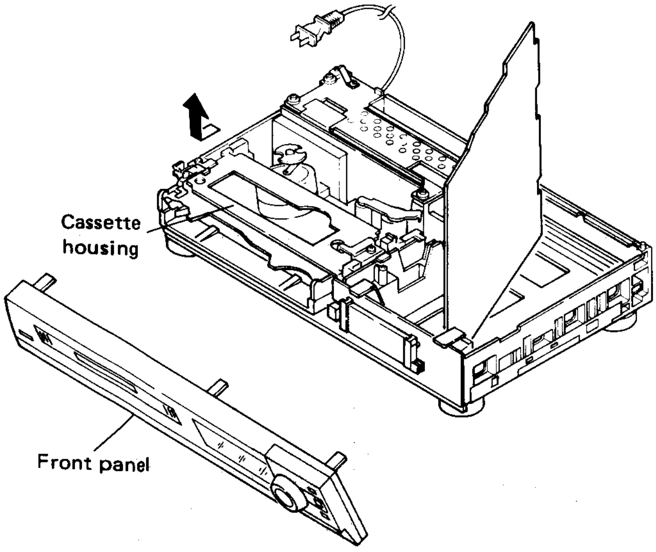

Cassette housing
Front panel

Fig. 1-1-6

1.1.6 Cassette housing installation

1. On the main deck, observe the positional relationships of the parts indicated in Fig. 1-1-7.
   If necessary, turn the loading motor by hand to obtain these positions.

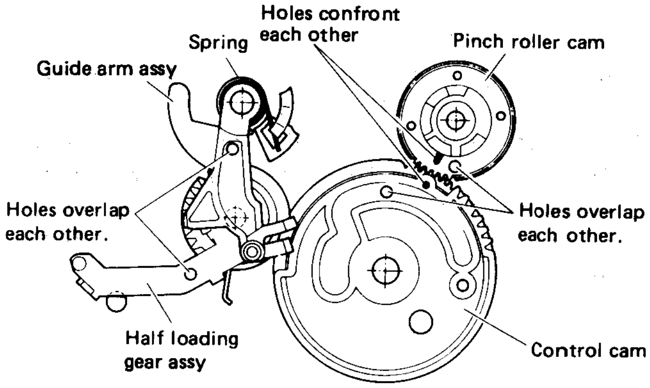

Holes confront each other
Spring
Pinch roller cam
Guide arm assy
Holes overlap each other.
Holes overlap each other.
Half loading gear assy
Control cam

Fig. 1-1-7

2. Refer to Fig. 1-1-8 and confirm that the clutch is engaged.
   If necessary, press the lever indicated by the arrow to where the clutch is locked.

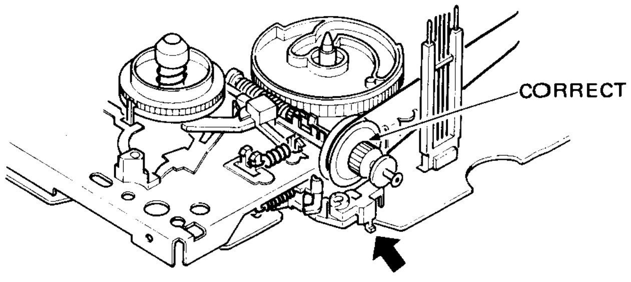


Fig. 1-1-8

3. Check that the cassette housing is in the eject state (internal holder of the cassette housing is locked in raised position).
   Set the cassette housing into place and secure with 4 screws.
4. Install the front panel as shown in Fig. 1-1-9 and re-engage the tabs. Supply power and use a spare cassette to check for normal loading and eject operations.

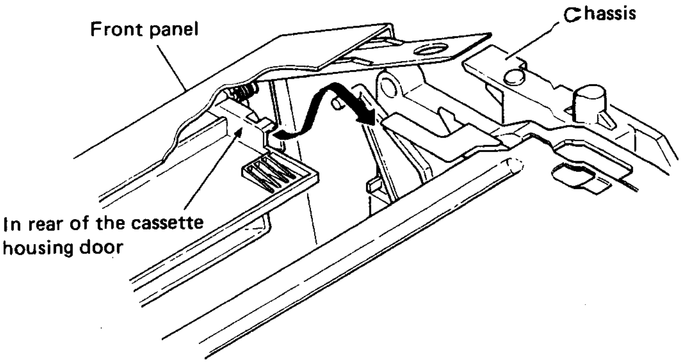
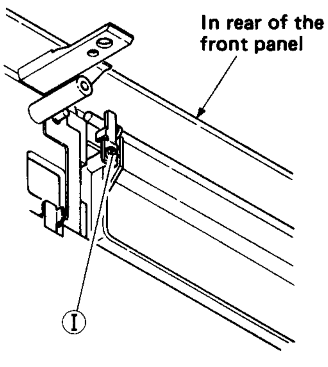

Front panel
Chassis
In rear of the cassette housing door

Fig. 1-1-9

5. Disconnect VCR from power, then reinstall the main board assembly and top cover.

1.1.7 Cassette housing door

1. Remove the top cover and front panel assembly.
2. Take out one screw Ⓘ of the front panel assembly.
3. Refer to Fig. 1-1-10 and use care regarding the torsion spring, then pull out the right end of the cassette housing door to move it.



Fgi. 1-1-10

1.1.8 Main-deck

1. Remove the top cover, front panel assembly and main board assembly.
2. Refer to Fig. 1-1-11 and take out 3 screws Ⓙ from the main-deck assembly.
3. Remove the main-deck assembly in the upward direction and disconnect a connector CN1 from the DECK TERMINAL board, connectors CN1, CN2 from the Pre/Rec board, connector CN1 from the A/C head board, connector CN1 from the Loading MDA board and connector CN1 from the Drum MDA board.

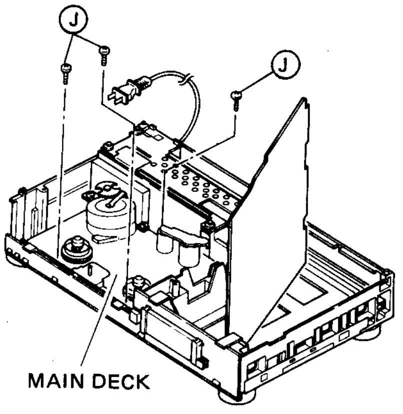


Fig. 1-1-11

1.1.9 Video unit board assembly

1. Remove the top cover and remove the main board assembly as shown in Sec. 1.1.4.
2. Refer to Fig. 1-1-12 and unsolder the video unit board assembly from main board assembly.
   pull it downward.

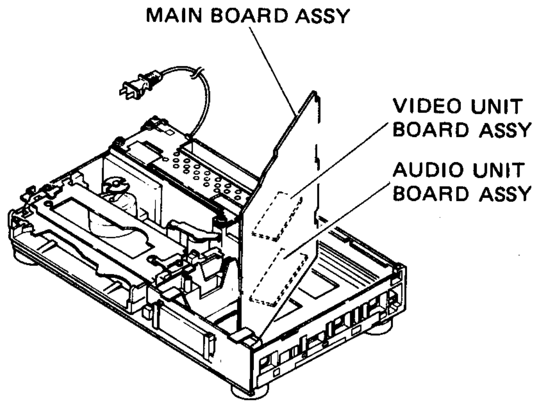


Fig. 1-1-12

1.1.10 AUDIO UNIT board assembly

1. Remove the top cover and main board assembly.
2. Refer to Fig. 1-1-12. Unsolder the audio unit board assembly from main board assembly.
   Pull it downward.

1.1.11 Switching regulator board assembly

1. Remove the top cover.
2. Refer to Fig. 1-1-13 and take out 4 screws Ⓜ from the switching regulator board assembly.
3. Remove the switching regulator board assembly in the upward direction.

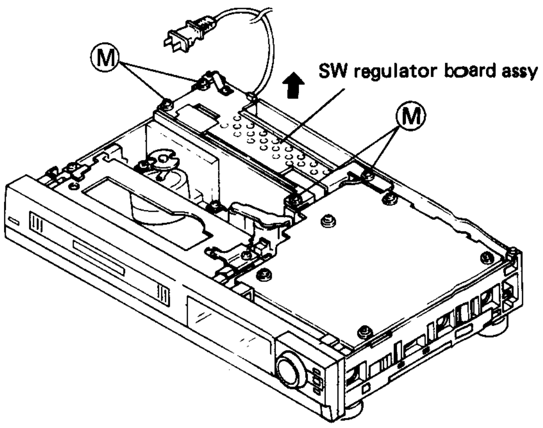


Fig. 1-1-13

1.2 MECHANISM ADJUSTMENTS

1.2.1 Precautions

1. Disconnect mainframe from AC power before soldering.
2. Avoid imparting stress to wires when disengaging connectors.
3. Determine and correct the cause of difficulty before proceeding to adjustments. Do not disturb settings unnecessarily.
4. Use care not to damage tabs, claws, etc. during repairs.
5. Install the cassette housing assembly only when the mechanism is in the Eject or Stop mode position. In the Eject mode, the internal holder of the housing is fully raised. This is fully lowered in the Stop mode.
6. When installing the front panel assembly, be sure to engage the housing door with the door lever of the cassette housing assembly. If this is omitted, the door will not open at Eject and the cassette cannot be removed.

1.2.2 Check without cassette housing

Mechanism operations can be observed easily by removing the cassette housing assembly. Note the following.

1. Disable the photo transistor sensor (END SENSOR) on the main-deck by applying an opaque cover.
2. Connect pins 2 and 3 of Main board connector CN601.
3. Select the desired modes with the operation buttons. However, notice that without tape, setting for the reverse direction modes produces the Stop mode after a few seconds due to absence of the reel sensor output.

1.2.3 Manually removing cassette tape

In event of electrical system failure that prevents the tape from being unloaded, the tape can be removed manually by the following procedure. Refer to Figs. 1-3-1, 1-3-2 and 1-3-3.

1. Disconnect power cord from AC outlet.
2. Turn the loading motor by hand so that the control cam rotates clockwise. This retracts the pole base assembly to the unloading position.
3. Continue turning to where the guide arm and half loading gear assemblies shift to beneath the cassette.
4. Turn the clutch assembly at the rear of the deck to absorb slack tape within the cassette.
5. Again turn the loading motor in the same direction to raise the cassette and remove it.

1.2.4 Test equipment

The following special tools and fixtures are required for mechanism adjustment.

1. Alignment tapes : MH-1 and MH-1L
   Stairstep signal is employed for interchangeability checks and adjustments.
2. Torque gauge : PUJ48075-2
   Measures tape take-up torque.
3. Back tension cassette gauge : PUJ48076-2
   Measures tape tension at the supply side.
4. A/C head positioning tool : PUJ47351-2
   Shifts the head base for adjusting the control head position.
5. Roller driver : PTU94002
   Turns the guide roller for adjusting FM linearity.
6. Presetting unit: PTU94008
   Use for EP auto tracking preset adjustment.

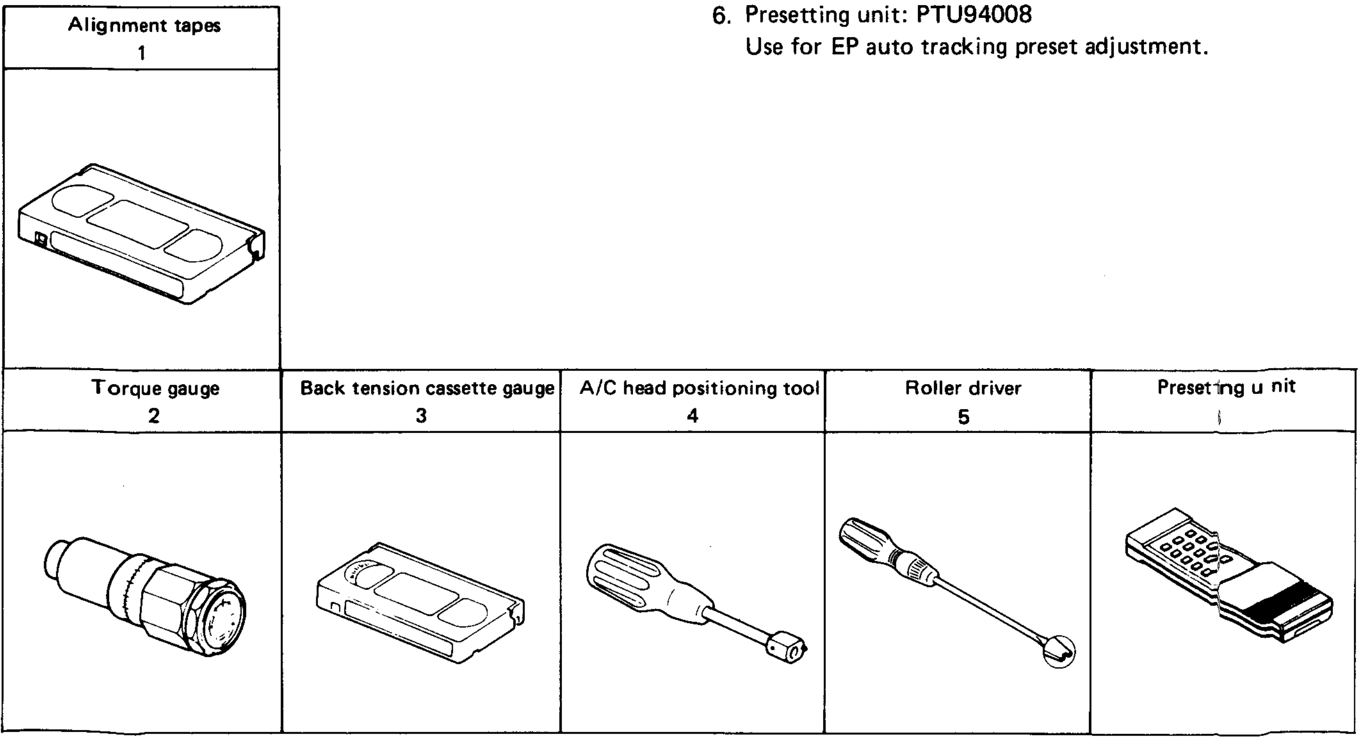


Fig. 1-2-1 Test equipment

1.3 MAIN MECHANISM PARTS

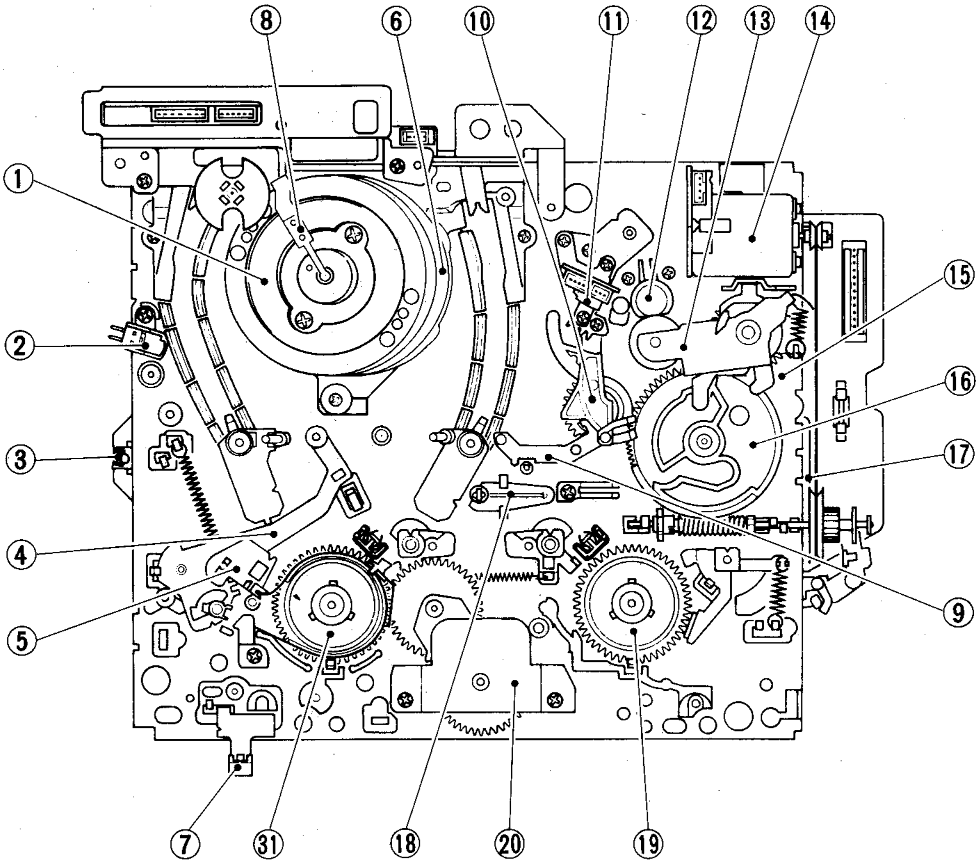

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Fig. 1-3-1 Top view of main-deck

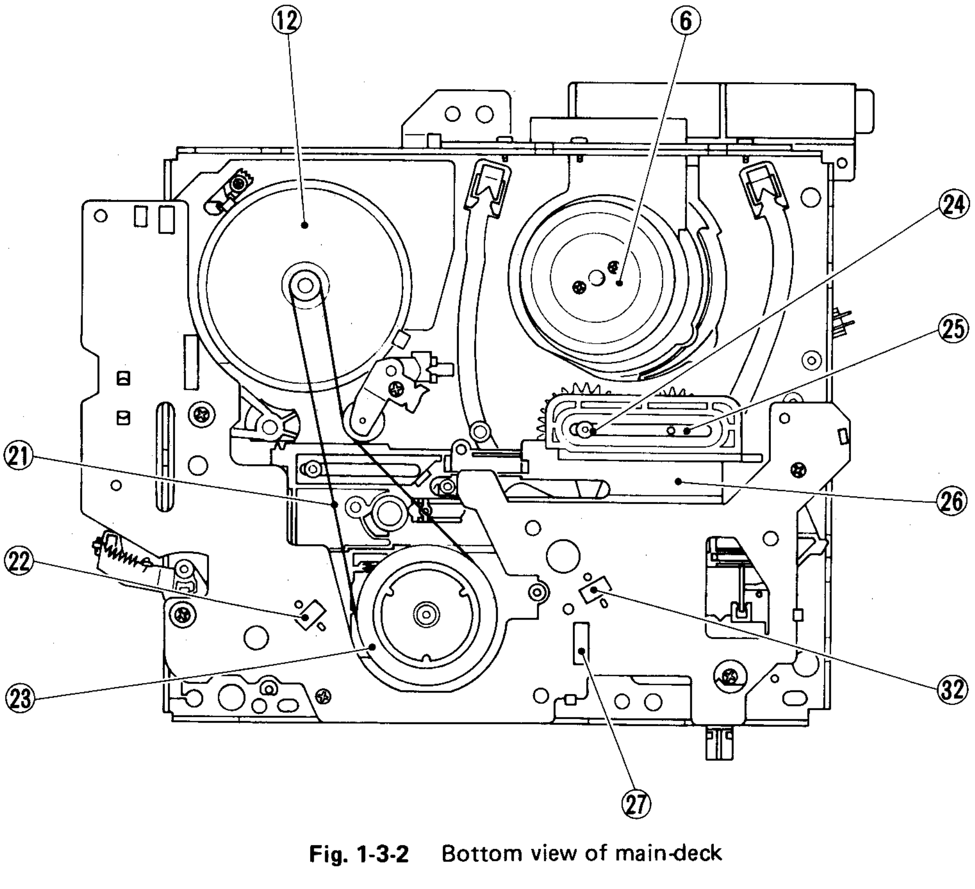
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Fig. 1-3-2 Bottom view of main-deck

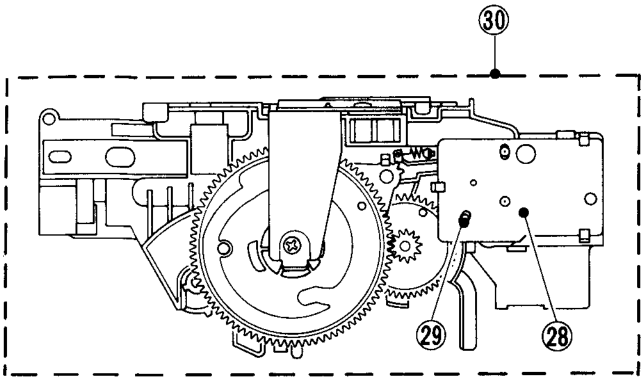


Fig. 1-3-3 Side view of cassette housing

A. Cleaning

Periodic cleaning of the tape transport system is desirable, but ordinarily not feasible in practice. Therefore, perform cleaning when a set is brought in for repairs or maintenance. Contamination of the video heads, tape guides and brushes can detract from playback picture quality and in extreme cases, even damage the tape. For cleaning, use a fine-mesh cotton cloth (about the texture of a white dress-shirt) moistened in alcohol.

- To clean the video heads, press the moistened cloth gently against the upper drum with fingertip and turn the drum by hand.
- Do not use a vertical stroke, as this may damage the heads.

B. Lubrication

Oil and grease do not normally require periodic replenshing. Apply only when replacing lubricated parts (also clean and replace lubrication of mating parts if soiled).

For parts and points to apply oil and grease, refer to the exploded views of the mechanism assembly.

Before oiling, clean with alcohol.
Apply one or two drops of oil. Avoid excess oil.

1. Table 1-1 indicates the oil and grease used in this set. Use these or recommended locally available equivalents.

Category	Part No.
Oil	COSMO-HV56
Grease	KANTO-G-31KAV

Table 1-1

2. Grease is not required for a replacement cassette housing assembly, as this has been applied at the factory.

Note: ***Stir grease that has been stored for an extended period.***

C. Main mechanical parts

See Fig.s 1-3-1, 1-3-2 and 1-3-3.

No.	Symbol	Parts Name	See Section
1	M32A	Upper drum assy	1.8.1
2	M44	Full erase head	
3	51Q1	End sensor	
4	M41	Tension arm assy	1.8.4
5	M42	Tension band assy	1.8.4
6	M32C	Lower drum motor assy	1.8.2
7	M461	REC safety switch	
8	M32D	Brush assy	
9	M449	Half loading gear assy	1.8.5
10	M447	Guide arm assy	1.8.5
11	M48	A/C head	1.8.3
12	M422	Capstan motor	
13	M442	Pinch roller arm assy	
14	M434	Loading motor assy	
15	M446	Pinch roller cam	1.8.5
16	M438	Control cam	1.8.5
17	M437	Loading belt	
18	M460	LED holder (D1)	
19	M430	Reel disk (take-up)	
20	M424	Idler gear assy	
21	M429	Reel belt	
22	51PHS1	Take up reel sensor (PHS1)	
23	M426	Clutch assy	1.8.6
24	M433	Take up loading arm assy	1.8.7
25	M432	Supply loading arm assy	1.8.7
26	M439	Plate assy	1.8.7
27	M462	Slide switch (S3)	
28	56PHS3	Cassette sensor (PHS3)	
29	56Q2	Start sensor (Q2)	
30	M35	Cassette housing assy	
31	M470	Reel disk (supply)	
32	51PHS2	Supply reel sensor (PHS2)	

- Symbol interpretation example

M32A
Ref. No.
Exploded view symbol

56 Q2
Ref. No.
Board No.

1.4 INSPECTION AND MAINTENANCE

This product employs rotary and moving parts which wear out in the course of usage. Periodic inspection, cleaning, lubrication and maintenance are therefore important for ensuring maximum performance. Worn parts must also be replaced at when required.

1.4.1 Suggested servicing schedule for main components

The following table indicates the suggested period for such service measures as cleaning, lubrication and replacement. In practice, the indicated periods will vary widely according to environmental and usage conditions. However, the indicated components should be inspected when a set is brought for service and the maintenance work performed if necessary.

Also note that rubber parts may deform in time, even if the set is not used.

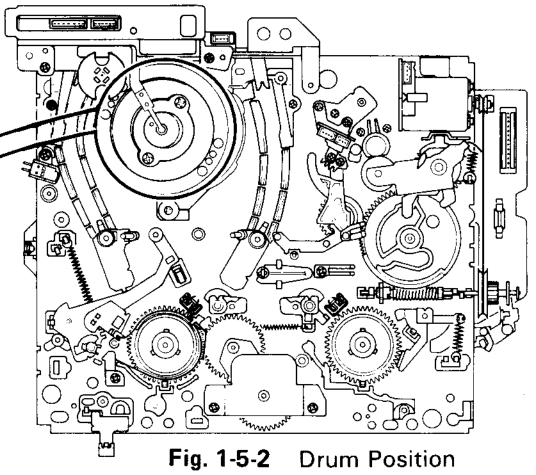
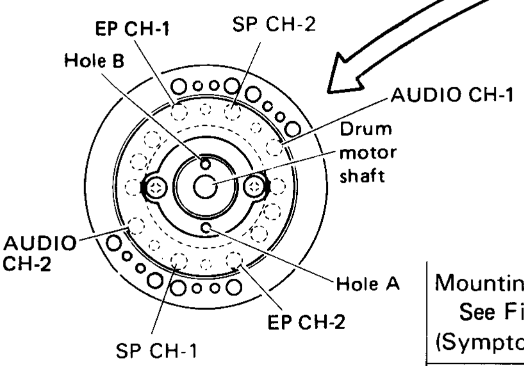
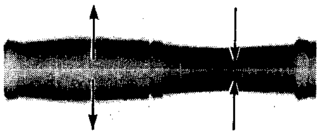
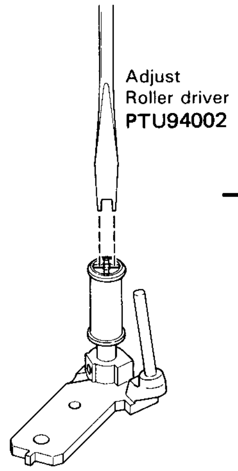
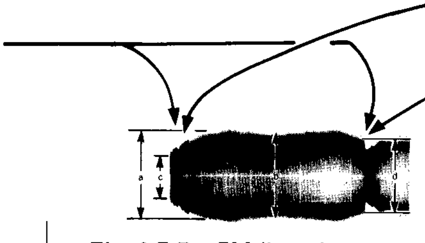
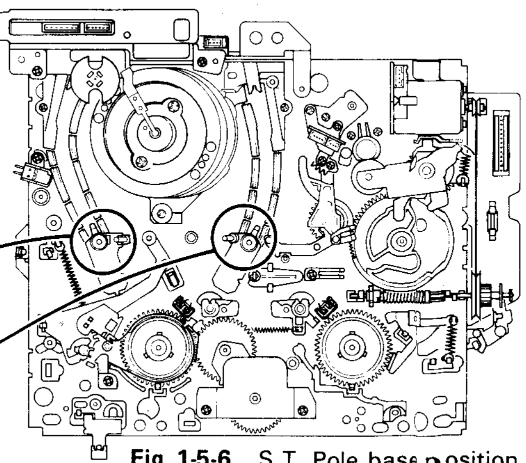
System	No.	Parts Name	Symbol No.	Periodic servicing schedule (operation hours)								
				250	500	750	1000	1250	1500	1750	2000	Overall
Tape Transport	1	Upper drum	M32A	★	★	☆	○	○	○	○	○	●
	11	A/C head	M48	★	★	★	○	○	○	○	○	●
	13	Pinch roller	M442	★	★	★	○	○	○	○	○	●
	2	Full erase head	M44	★	★	★	○	○	○	○	○	●
	4	Tension arm	M41									●
	6	Lower drum	M32C				○	○	○	○	○	●
	12	Capstan (shaft)	M422	★	★	★	★	★	★	★	★	●
	9	Half loading gear	M449									●
	10	Guide arm	M447									●
Drive	12	Capstan motor	M422				○	○	○	○	○	●
	17	Loading Belt	M437				○	○	○	○	○	●
	21	Reel Belt	M424				○	○	○	○	○	●
	19	Take-up reel disk	M430				○	○	○	○	○	●
	31	Supply reel disk	M470				○	○	○	○	○	●
	23	Clutch assy	M426								○	●
	14	Loading motor	M434				○	○	○	○	○	●
		Worm clutch assy	M436								△	●
		Plate assy	M439								△	●
Others	5	Tension band	M42				○				○	●
	8	Brush	M32D				○				○	●

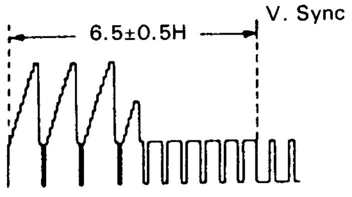
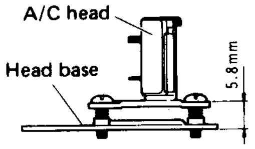
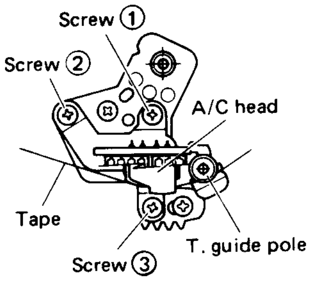
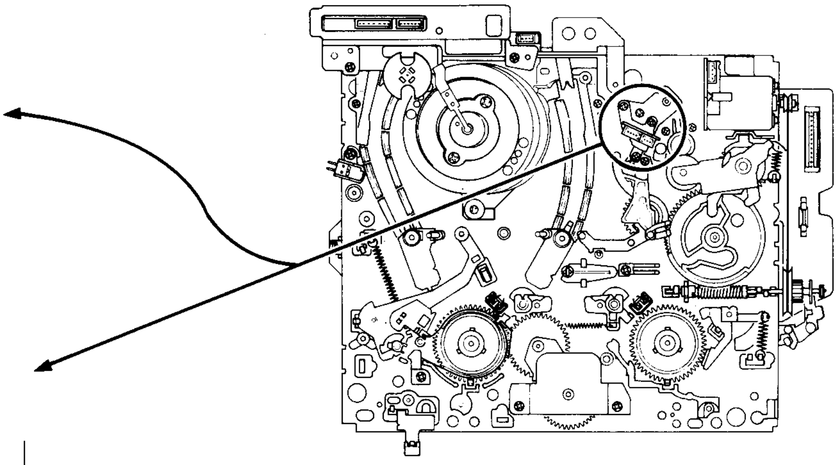
★ : Cleaning
☆ : Cleaning (or Replacement if necessary)
△ : Lubrication
No: Refer to Main mechanical parts

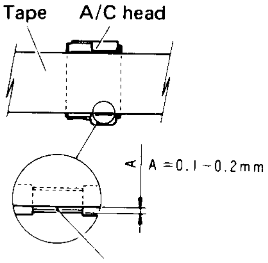
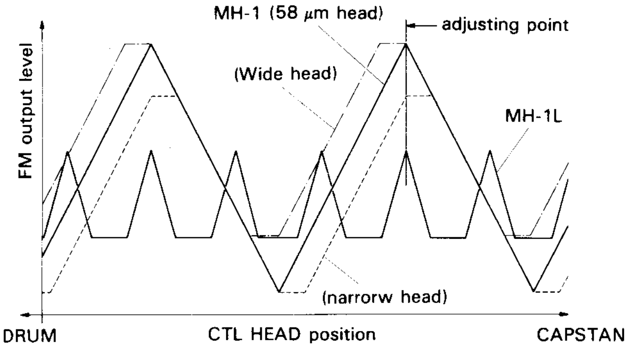
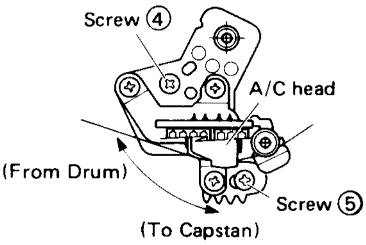
▲ : Lubrication (or Replacement if necessary)
● : Replacement
○ : Inspection or Replacement if necessary

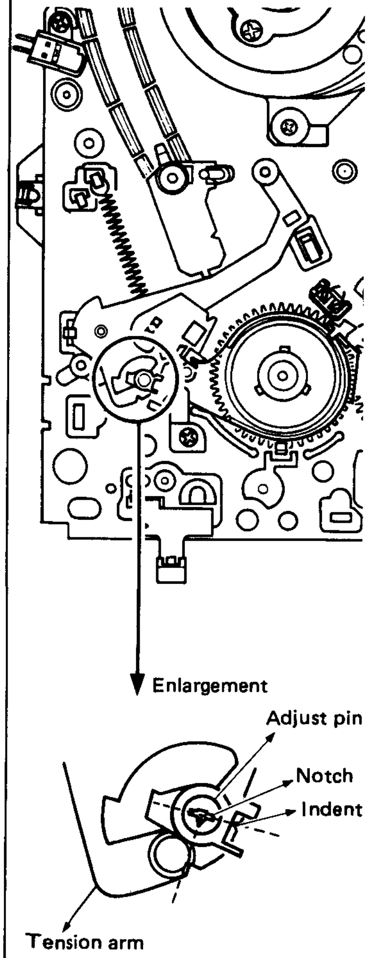
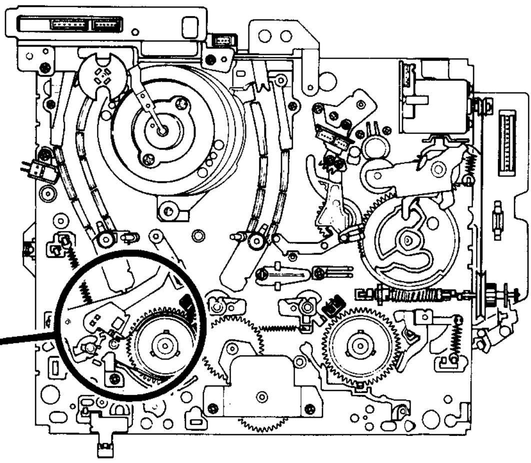
Table 1-4-1 Approximate maintenance schedule

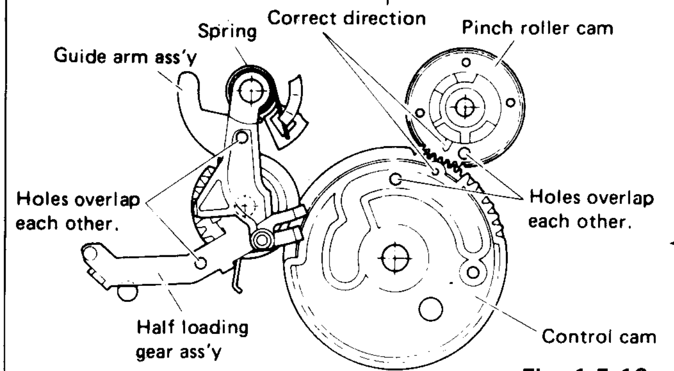
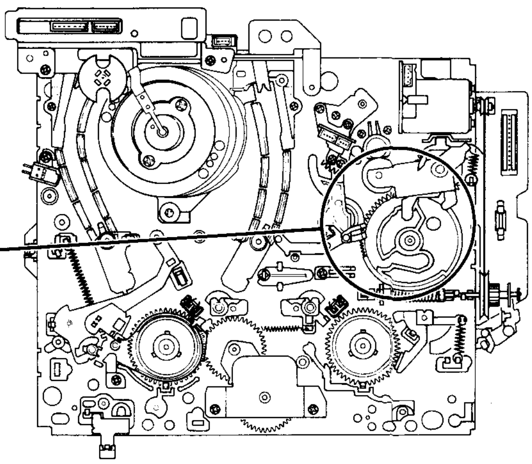
1.5 MAIN PARTS REMOVAL AND REPLACEMENT

No.	Item	Checkpoints	Adjustment and Checks
1	Upper drum assembly •Symptoms: FM signal absent, intermittent or weak on one channel; large difference in channel output levels •Cause: Worn or damaged video heads, poor response, etc.	 Fig. 1-5-2 Drum Position	
	 EP CH-1 SP CH-2 Hole B AUDIO CH-1 Drum motor shaft AUDIO CH-2 Hole A EP CH-2 SP CH-1 **Fig. 1-5-1** DRUM TOP VIEW	Mounting direction See Fig. 1-5-1. (Symptom: no picture)	After replacing, observe that upper drum hole A is opposite the motor axis from lower drum hole B.
		Axis wobble See Fig. 1-5-2. (Symptom: jitter, poor FM linearity) PB FM: Main board TP206 FF: Main board TP411	Record and playback in EP mode. Confirm absence of large difference between channels. (Fig. 1-5-3)  **Fig. 1-5-3** Axis wobble
	 **Fig. 1-5-4** S.T. Pole base	FM linearity check See Fig. 1-5-5. (Symptom: vertical sync absent, picture noise) PB FM: Main board TP206 FF: Main board TP411  **Fig. 1-5-5** FM linearity $\frac{b}{a} \geqq 0.7, \frac{c}{a} \geqq 0.65, \frac{d}{a} \geqq 0.65$	 **Fig. 1-5-6** S.T. Pole base position 1) Play stairstep signal of the MH-1 Alignment Tape. Confirm absence of obvious FM waveform loss and that operating the Tracking yields the optimum point. 2) Refer to Fig. 1-5-4, adjust for loss at the left edge (drum entry) of the FM waveform by turning the guide roller of the supply pole base. Similarly, adjust for loss at the right edge (drum exit) by turning the guide roller of the take-up pole base. **Note:** *If FM loss occurs on both channels and cannot be corrected by adjusting the guide rollers, the lower drum needs replacement.*

No.	Item	Checkpoints	Adjustment and Checks
	PB switching point •Symptom: switching noise at picture bottom.	VIDEO OUT or TP252 (Main board)  **Fig. 1-5-7** PB Switching Point	1) Connect VCR to AC. Turn power on. 2) Connect an oscilloscope to VIDEO OUT or TP252. 3) Insert the MH-1 alignment tape to the cassette housing. Play back the stairstep segment of MH-1 alignment tape. 4) Trigger the oscilloscope externally (– slope) with the signal from TP411 (DRUM FF) of the video board. 5) Adjust R427 to position the trigger point 6.5 H ±0.5 H from V. sync as shown in Fig. 1-5-7.
2	Lower drum assembly •Symptoms: Poor FM linearity, noisy rotation, jitter •Cause: Lead and bearing wear	Check FM linearity and switching point.	See above upper drum assembly items.
		Check control head phase (X value) Symptom: tracking error PB FM: Video board TP206 FF: Video board TP411	1) Play stairstep signals of MH-1 and MH-1L Alighment Tapes. Engage the Tracking Preset mode by pressing the + and – buttons simultaneously in the onscreen mode. Confirm that the same maximum FM waveform level is obtained as when the tracking is adjusted manually. 2) Refer to the A/C head adjustments.
3	**A/C head**  **Fig. 1-5-8** Temporary height  Screw ① Screw ② A/C head Tape T. guide pole Screw ③ **Fig. 1-5-9** Inclination/Azimuth/ Height adj.	 **Fig. 1-5-10** A/C HEAD position	
		Temporarily set height as indicated in Fig. 1-5-8.	Set the height as indicated in Fig. 1-5-8to facilitate tape transport checks and adjustments.
		Tilt (forward inclination) See Fig. 1-5-9. (Symptom: audio level varies greatly.)	1) Run tape, turn screw ① counterclockwise to where slight curling of the tape occurs at the lower flange of the take-up guide roller. 2) Then slowly turn the screw clockwise to where the curling ceases.
		Azimuth See Fig. 1-5-9. (Symptoms: audio low level or noisy) Audio output: Main board AUDIO OUT	1) Set front panel AUDIO MONITOR selector to Normal and play stairstep signal (with audio 7 kHz) of the MH-1 Alignment Tape. Observe audio output signal with oscilloscope. 2) Turn screw ② and adjust for maximum audio output level.

No.	Item	Checkpoints	Adjustment and Checks
	 **Fig. 1-5-11** Height Adj	Height See Fig.s 1-5-9 and 1-5-11. (Symptom: low audio and control signal levels)	1) Run tape and observe the control head area. 2) Turn screws ①, ② and ③ by small and equal amounts until 0.1 to 0.2 mm of the head core bottom can be seen. **Note:** *If difficult to observe, play stairstep signal of MH-1 Alignment Tape and adjust for maximum audio output and control pulse level.*
		FM linearity	Refer to upper drum assembly items. If adjustment is major, again check the azimuth.
	 **Fig. 1-5-13** CTL head phase **Note:** *Trigger the oscilloscope externally signal from TP411 (DRUM FF). Use (+) trigger for MH-1 and MH-1L alignment tape.*	Control head phase See Fig. 1-5-12 PB FM: Video board TP206 FF : Video board TP411  Screw ④ A/C head (From Drum) Screw ⑤ (To Capstan) **Fig. 1-5-12** CTL head phase	1) Play stairstep signal of MH-1 Alignment Tape and observe the FM waveform. Set for Tracking Preset by pressing the + and − buttons simultaneously in the onscreen mode. 2) Loosen screws ④ and⑤. Set the A/C head positioning tool on screw ④, with the stud inserted into the nearby oblong hole. 3) Turn the tool first to position the A/C head fully toward the capstan. Then gradually return it toward the drum and stop at the position of maximum FM waveform output level as shown in Fig. 1-5-13. 4) Tighten screw ⑤ . Remove the tool and tighten screw ④. 5) Play stairstep signal of MH-1L Alignment Tape and confirm maximum FM waveform output level as shown in Fig. 1-5-1 3. 6) If not maximum, slightly loosen screws ④ and ⑤. Use the tool and adjust the head position for the nearest maximum point. Then tighten screws ④ and ⑤.

No.	Item	Checkpoints	Adjustment and Checks
		EP auto tracking adjustment	1) Terminate the video output at 75 ohms with a monitor-TV and connect oscilloscope to PB FM (TP206). 2) Set MH-1L Alignment Tape into the cassette housing and play the stairstep signal. 3) Confirm that the A/V digital tracking LED changes from flashing to lighted. 4) Press button "D" of the preset unit (PTU94008) to extinguish the A/V digital tracking LED. 5) Again press button "D" to enter the EP interchangeability adjust mode. Confirm that the A/V digital tracking LED changes from flashing to extinguished. Press the stop button. Note: *If the Alignment Tape ejects automatically, repeat the control head phase adjustment.*
4	Tension arm assembly Tension band assembly  **Fig. 1-5-14** Tension arm assy	Tension pole position See Fig. 1-5-14. (Symptom: poor FM waveform response)	 **Fig. 1-5-15** Tension arm position 1) Check that the cassette housing is in the eject state (internal holder of the cassette housing is locked in raised position). 2) Turn the eccentric adjust pin to align the notch of the pin with the tension arm indent as shown in Fig. 1-5-14.
		Back tension (Symptom: skew)	1) When the tension pole position is correctly adjusted, the back tension will assume the correct value. 2) Use the Back Tension Cassette Gauge and set for the playback mode. Confirm reading of 35 to 48. 3) Changing the tension pole position in order to vary the back tension will cause adverse effects elsewhere.

No.	Item	Checkpoints	Adjustment and Checks
5	Pinch roller cam Control cam Half loading gear assembly Guide arm assembly	 Spring Correct direction Pinch roller cam Guide arm ass'y Holes overlap each other. Holes overlap each other. Half loading gear ass'y Control cam **Fig. 1-5-16** Control/Pinch roller cam Important: Do not remove or disturb parts other than those mentioned. See Fig. 1-5-16.	Set mechanism to Eject mode internal holder of the cassette housing is locked in raised) position.  **Fig. 1-5-17** Control cam position 1) When installing the pinch roller cam, overlap the largest hole of the gear portion with the hole of the deck. 2) Set the control cam on the deck with the hole of the groove overlapped with the hole of the deck. Observe that the small hole of the control cam and the ridge of the pinch roller cam are aligned. (If the control cam does not fit readily, shift the rear plate assembly within the range of play.) 3) Install the half loading gear assembly with the hole overlapped with the hole of the deck. Secure with E-ring. 4) Install the guide assembly over the spring and with the hole overlapping that of the deck. Engage the spring correctly.
		Cassette housing assembly	Install the cassette housing assembly with the mechanism in the Eject mode. Also observe that the inner holder of the housing is raised and locked.
6	Clutch assembly	Take-up torque (Symptom: inadequate take-up torque)	1) Remove cassette housing and set for play-back mode (see Section 1.2). 2) Set torque gauge on the take-up reel disk. Gradually relax your grip on the gauge and read the needle indication at the point the gauge begins to rotate with the disk. Confirm indication of 60 to 100.

No.	Item	Checkpoints	Adjustment and Checks
7	Take-up loading arm assembly Supply loading arm assembly Plate assembly		**Notes:** • *Set mechanism to the Eject or Stop mode before removing these parts.* • *The flange of the plastic rivet securing the loading arm assembly and the pole base assembly can be damaged by attempting to remove it directly. Press the loading arm assembly firmly to prevent motion. Then use a narrow-shafted tool to press the rivet from the shaft end to remove it.*
		Mounting position alignment • Remove the tension arm assembly to facilitate operation. See Fig. 1-5-18.	1) Set the supply and take-up loading arm assemblies so that the holes of the gear portions are aligned, then secure to the pole base assemblies with rivets. 2) Shift the plate assembly and install with the holes of the upper and lower components overlapped.
		Slide switch See Fig. 1-5-18.	Be sure to engage the slide switch slider with the edge of the plate assembly.

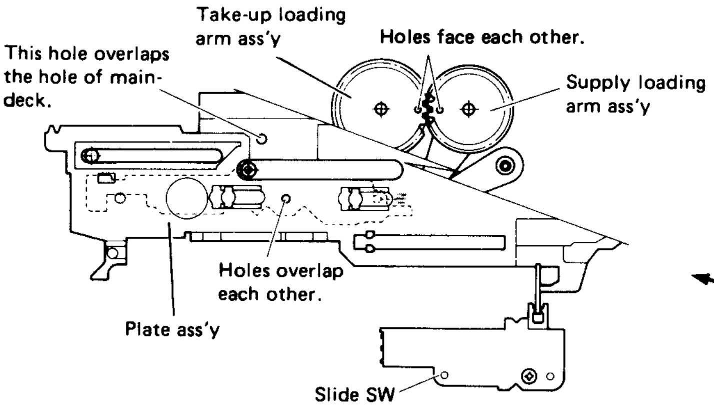

Take-up loading arm ass'y
Holes face each other.
This hole overlaps the hole of main-deck.
Supply loading arm ass'y
Holes overlap each other.
Plate ass'y
Slide SW

Fig. 1-5-18

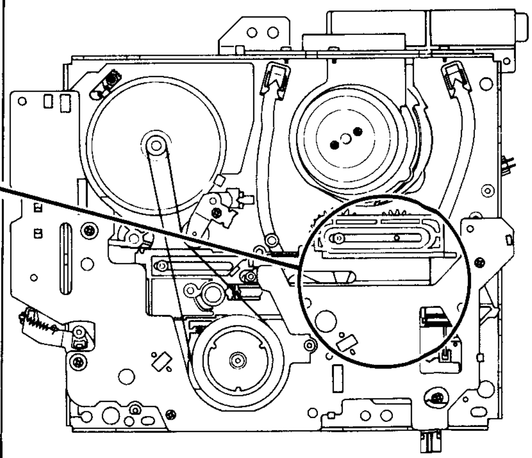


Fig. 1-5-19
T.S. Loading arm position

SECTION 2
ELECTRICAL ADJUSTMENTS

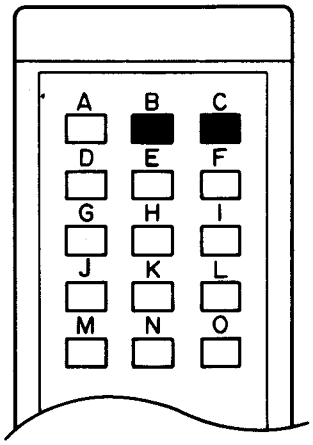
2.1 PREPARATION

Electrical adjustments are required after replacing circuit components and certain mechanical parts.
It is important to perform these adjustments only after all repairs and replacements have been completed. Also, do not attempt these adjustments unless the proper equipment is available.

2.1.1 Required test equipment

1. Color television or monitor
2. Oscilloscope: wide-band, dual-trace, triggered delayed sweep
3. Frequency counter
4. Audio oscillator
5. Audio voltmeter
6. Digital voltmeter
7. Signal generator: RF/IF sweep/marker
8. Signal generator: NTSC color bar, stairstep
9. Distortion meter
10. Recording tape
11. Alignment tapes: (MH-1, MH-1L)
12. Presetting unit (PTU94008)

Presetting unit


A
B
C
D
E
F
G
H
I
J
K
L
M
N
O

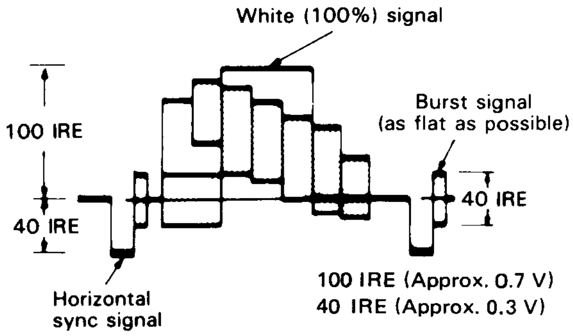

White (100%) signal
Burst signal
(as flat as possible)
100 IRE
40 IRE
40 IRE
Horizontal
sync signal
100 IRE (Approx. 0.7 V)
40 IRE (Approx. 0.3 V)

Fig. 2-1-1 Color bar signal of pattern generator

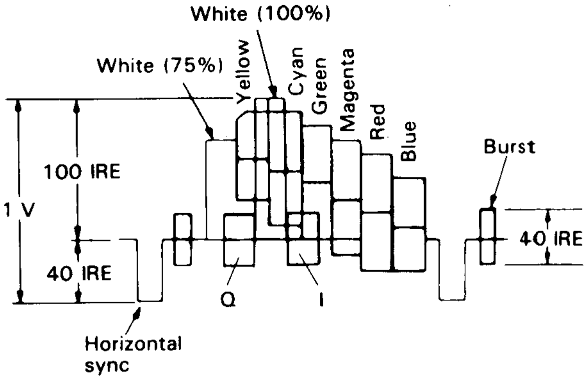

White (100%)
White (75%)
White
Yellow
Cyan
Green
Magenta
Red
Blue
Burst
100 IRE
1 V
40 IRE
40 IRE
Q
I
Horizontal
sync

Fig. 2-1-2 Color bar signal waveform

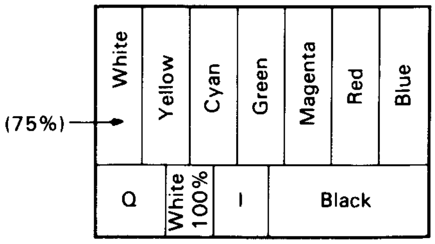

White
Yellow
Cyan
Green
Magenta
Red
Blue
(75%)
Q
White
100%
I
Black

Fig. 2-1-3 Color bar pattern

2.1.2 Check and adjustment steps

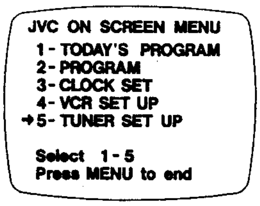
The check and adjustment steps are provided in the following in the form of charts. For clarity, the nomenclature used in the charts is outlined below.

No.	Checks and adjustments are numbered in the recommended sequence in which they are to be performed.
Item	Name assigned to the particular check and adjustment step.
Check Point	Location to which measuring instrument (oscilloscope unless otherwise noted) is to be connected.
Adjustment Parts	Variable component (resistor, capacitor, etc.) to be adjusted in this step. Dash (–) indicates check only.
Signal & Mode	• Input signal required to perform adjustment. Dash (–) indicates that special signal is not required. • Equipment operating mode at time of check or adjustment.
Color bars	Color bar signal as video input.
Stairstep	Stairstep signal as video input.
1 kHz	1 kHz sinewave as audio input signal.
MH-1 color bars	Color bar segment of MH-1 alignment tape.
MH-1 stairstep	Stairstep segment of MH-1 alignment tape.
MH-1 1 kHz	1 kHz audio signal segment of MH-1 alignment tape.
MH-1 RF sweep	RF sweep segment of MH-1 alignment tape.
MH-1L color bars	Color bars segment of MH-1L alignment tape.
MH-1L stairstep	Stairstep segment of MH-1L alignment tape.
MH-1L RF sweep	RF sweep segment of MH-1L alignment tape.
MH-1M color bars	Color bar segment of MH-1M alignment tape.
MH-1M stairstep	Stairstep segment of MH-1M alignment tape.
MH-1H color bars	Color bar segment of MH-1H alignment tape.
MH-F1 stairstep	Stairstep segment of MH-F1 alignment tape.
MH-F1 1 kHz	1 kHz FM audio signal segment of MH-F1 alignment tape.
E-E	Power on and machine in Stop mode.
REC	Recording mode
PB	Playback mode
SEARCH	Search (FWDS and REVS) playback mode
SLOW	Slow motion playback mode
STILL	Pause during playback mode
A DUB	Audio dubbing mode
SP mode	SP recording speed
EP mode	EP recording speed
LP mode	LP recording speed
Description	This column provides an explanation of the step, notes and adjustment values, and reference to waveforms where applicable.

2.1.3 Confirmation

Before adjustment, use the MENU button function to set the TODAY'S PROGRAM, PROGRAM, CLOCK, VCR SET UP and TUNER SET UP.

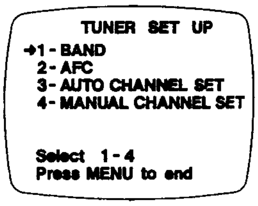
1. Press the MENU button.
   - The following MENU appears on the monitor-TV as shown in Fig. 2-1-4.
2. The TUNER SET UP menu provides on screen display of the BAND, AFC, AUTO CHANNEL SET and MANUAL CHANNEL SET, as shown in Fig. 2-15 and Fig. 2-1-6.


JVC ON SCREEN MENU
1-TODAY'S PROGRAM
2-PROGRAM
3-CLOCK SET
4-VCR SET UP
→5-TUNER SET UP

Select 1-5
Press MENU to end

•selected by SET (– or +)

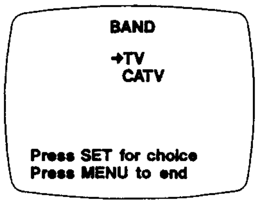
Fig. 2-1-4


TUNER SET UP
→1-BAND
2-AFC
3-AUTO CHANNEL SET
4-MANUAL CHANNEL SET

Select 1-4
Press MENU to end

•selected by SET (– or +)

Fig. 2-1-5

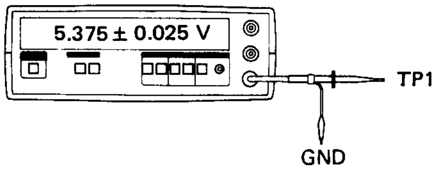
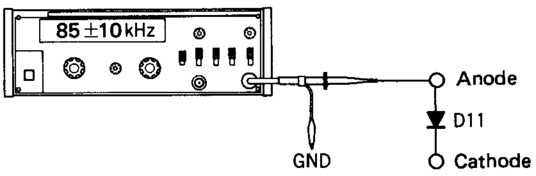

BAND
→TV
CATV

Press SET for choice
Press MENU to end

Fig. 2-1-6

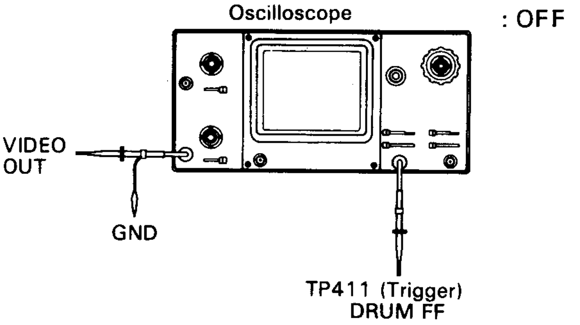
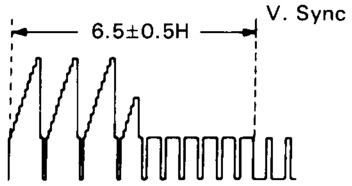
2.2 SWITCHING REGULATOR CIRCUIT

Note: ***Unless otherwise specified, all test points and adjustments are located on the SWITCHING REG board.***

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	5V DC output voltage	TP1 (INPUT) TP3 (GND)	R28 (SWD 5V ADJ)	• Tuner mode • REC • SP mode	1) Insert recording video cassette to the cassette housing and set for the REC mode. 2) Connect a digital voltmeter as shown in Fig. 2-2-1. 3) Adjust R28 for 5.375 ± 0.025 V. Digital Voltmeter  **Fig. 2-2-1**
2	OSC frequency Frequency counter 	D11-Anode		• Tuner mode • REC • SP mode	1) Insert recording video cassette to the cassette housing and set for the REC mode. 2) Connect a digital voltmeter as shown in Fig. 2-2-2. 3) Confirm that oscillator frequency is 85 ± 10 kHz.

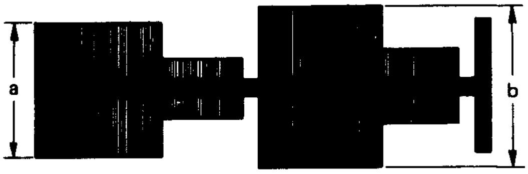
2.3 SERVO CIRCUIT

Notes: *1. Unless otherwise specified, all test points and adjustments are located on the MAIN board.*
2. T indicates the time and volts/division setting of the oscilloscope (use 10:1 probe).

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	SP PB switching point	VIDEO OUT or TP252	R427 (SP PB SW point)	• PB MH-1 stairstep • Trigger slope (−) • SP mode • Auto tracking : OFF	1) Connect an oscilloscope to VIDEO OUT or TP211 of the main board. 2) Play back the stairstep segment of MH-1 alignment tape. 3) Trigger the oscilloscope externally (— slope) with the signal from TP411 (DRUM FF). 4) Adjust R427 to position the trigger point 6.5 ± 0.5H from V. sync.
	 Fig. 2-4-1				 **Fig. 2-4-2** PB Switching Point
2	SP slow tracking preset	Monitor-TV	Presetting unit (PTU 94008)	• SP mode • REC then PB (slow)	**Note:** *Set VCR to A mode by remote controller.* 1) Set recording video cassette into the cassette housing. 2) Receive a color broadcast on a VHF-HI channel or supply a color bar signal to VIDEO IN. 3) Record a color broadcast or color bar signal in the SP mode. 4) Play back recorded signal in the FWD and REV slow mode and set the tracking control of the FRONT panel to the center position by simultaneously pressing the (+) and (—) tracking buttons. 5) Observe the display on a monitor-TV and adjust for optimum noise condition (best tracking) by depressing "B (−)" or "C (+)" buttons of presetting unit as required. 6) Depress the STOP button on the FRONT panel. 7) Confirm that the bar noise is not visible on the monitor in the slow mode.
3	EP slow tracking preset	Monitor-TV	Presetting unit (PTU94008)	• EP mode • REC then PB (slow)	1) In the same manner as the above SP slow mode.

2.4 VIDEO CIRCUIT

Note: *Unless otherwise specified, all tast points and adjustments are located on the MAIN board.*

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	REC color level and ch balance	IC201-5 (VIDEO UNIT board)	R210 (SP Rec color level)	• PB mode • MH-1 color bar • SP mode	1) Connect an oscilloscope to IC201-5 pin and observe color signal level. 2) Insert the MH-1 alignment tape to the cassette housing, play back the color bar segment of MH-1 alignment tape. 3) Set the tracking of the FRONT panel to the Auto tracking off position by simultaneously pressing the "+" and "–" tracking buttons. 4) Adjust by pressing the "+" and "–" tracking buttons of the Front panel for maximum level of the color waveform and make a note of the higher color level "A". 5) Press the STOP button on the FRONT panel and eject the MH-1 alignment tape.
	 **Fig. 2-4-1** REC color level			• REC then PB • MH-1 color level • Auto tracking : OFF • SP mode	6) Insert recording video cassette to the cassette housing. Supply a color bar signal to VIDEO IN. 7) Trigger the oscilloscope externally with the signal from TP411 (DRUM FF) of the Main board. Use (–) trigger for CH1 and (+) trigger for CH2. 8) Record a color bar signal in the SP mode. 9) Play back recorded color bar signal. Set the tracking of the FRONT panel to the Auto tracking off position by simultaneously pressing the "+" and "–" tracking buttons and confirm 90 ± 5% of the noted color level at IC201-5. If necessary, before recording, adjust R210 so that the higher level channel becomes 90 ± 5% of the noted level "A" during playback as shown in Fig. 2-4-1. At this time, confirm that the channel level difference is within 5 dB. **Note:** *Repeat the above step (9) several times.*
		IC201-5 (VIDEO UNIT board)	R228 (EP Rec color level)	• EP mode • PB mode • MH-1 L color bar • Auto tracking : OFF	1) Repeat the above steps 1 to 7. 2) Record a color bar signal in the EP mode. 3) Play back recorded color bar signal. 4) Set the tracking of the FRONT panel to the Auto tracking off position by simultaneously pressing the "+" and "–" tracking buttosn.
				• EP mode • REC then PB • MH-1L color bar • Auto tracking : OFF	5) If necessary, before recording, adjust R228 so that the higher level channel becomes 85 ± 5% of the noted level during palyback as shown in Fig. 2-4-1. At this time, confirm that the channel level difference is within 4 dB. **Note:** *Repeat the above step (5) several times. Perform the EP mode adjustment after completing the SP mode.*

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
2	YNR NC balance	IC1-26 (VIDEO UNIT board)	R31 (YNR NC BAL) (VIDEO UNIT board)	• E-E • INPUT SEL: AUX • Color bar • SP mode	1. Supply a color bars signal to VIDEO IN and connect an oscilloscope to IC1-26 pin. 2. Adjust R31 for minimum DC step difference.

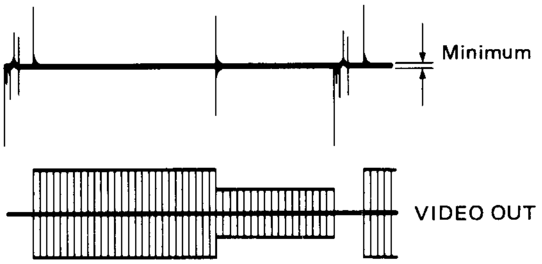


Fig. 2-4-2

2.5 AUDIO CIRCUIT

Note: *Unless otherwise specified, all test points and adjustments are located on the MAIN board.*

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Audio Bias Level	TP331 (INPUT) TP332(GND)	R307 (BIAS ADJ)	• AUX • SP mode • REC mode • No signal	1. Connect a millivoltmeter between TP331 and TP332. 2. Set for REC mode without signal. 3. Adjust R307 for 2.1 mVrms.
2	Audio PB Level	AUDIO OUT	R309 (PB LEVEL)	• REC • SP and EP mode • –8 dBs/1 kHz • AUX	1. Connect an oscilloscope to AUDIO OUT. 2. Supply an audio signal (–8 dBs/1 kHz) to AUDIO IN and record together with a video signal, then play back. 3. Adjust R28 so that the audio output level during playback becomes –6 ± 1 dBs at SP mode (–6 ± 2 dBs at EP mode).
3	E-E Level	AUDIO OUT	R310 [E-E LEVEL (L)]	• ALC: OFF • REC mode • AUDIO OUT to Hi-Fi	1. Supply a 1 kHz, –8 dBs audio signal to AUDIO IN and a VIDEO signal to VIDEO IN. 2. Set Hi-Fi REC level controls to detent position. In the REC mode, adjust R310 to obtain –6 ±0.5 dBs at AUDIO OUT.
			R311 [E-E LEVEL (R)]		3. In the same manner, adjust R311 for the R (CH 2) channel.
4	Level Indicator	FDP (Level Ind.)	R306 [LEVEL IND (L)]	• AUDIO OUT to Hi-Fi • AUX	**Note:** Perform the level indicator adjustment after completing the E-E level adjustment (section 2.5.3). 1. Supply a 1 kHz, –8 dBs audio signal AUDIO IN. 2. Set Hi-Fi REC level controls to detent position. Confirm that the Audio level is –6 ±0.5 dBs at AUDIO OUT. In the E-E (STOP) mode, adjust R306 to the point where the FDP level indicators show 0 dB.
			R305 [LEVEL IND (R)]		3. In the same manner, adjust R305 for the R (CH2) channel.

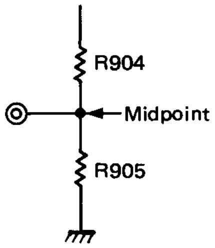
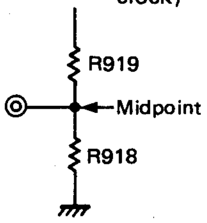
2.6 TIMER CIRCUIT

Note: *Unless otherwise noted, all test points and adjustments are located on the TIMER board.*

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Timer clock	IC701-37	C712 (Clock)	•E-E	1) Connect a frequecy counter between IC701-37 and GND. 2) Short IC701-18 to GND, then short the leads of electrolytic capacitor C702 once in order to reset IC701. All FDP Segments and power LED are off. 3) Adjust C712 for 2048.000 ± 0.002 Hz (488.2808 to 488.2818 μs).

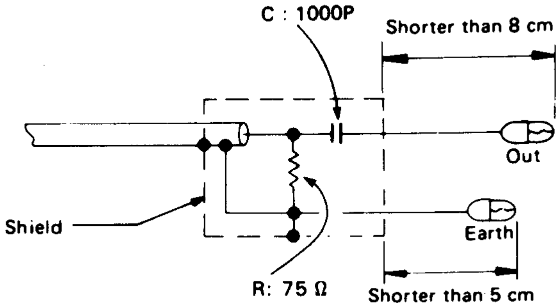
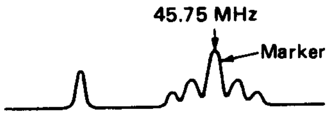
2.7 ON SCREEN CIRCUIT

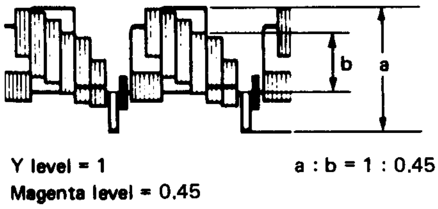
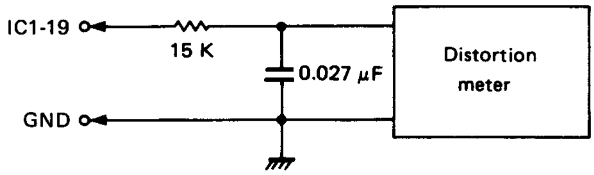
Note: *Unless otherwise specified, all test points and adjustments are located on the ON SCREEN board.*

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Dot clock	TP901 	C905 (Dot clock)	• E-E mode	**Note:** *For below adjustments use 1 : 1 probe with input capacitance less than 100 pF.* 1) Connect a frequency counter to TP901 (midpoint of R904 and R905) and GND. 2) Short IC901-3 pin to GND. 3) Adjust C905 for 7.70 ± 0.05 MHz.
2	Color burst clock	TP902 	C916 (Color burst clock)	• E-E mode	1) Connect a frequency counter to TP902 (midpoint of R918 and R919) and GND. 2) Adjust C916 for 14.31818 ± 0.00015 MHz.

2.8 TUNER/IF CIRCUIT

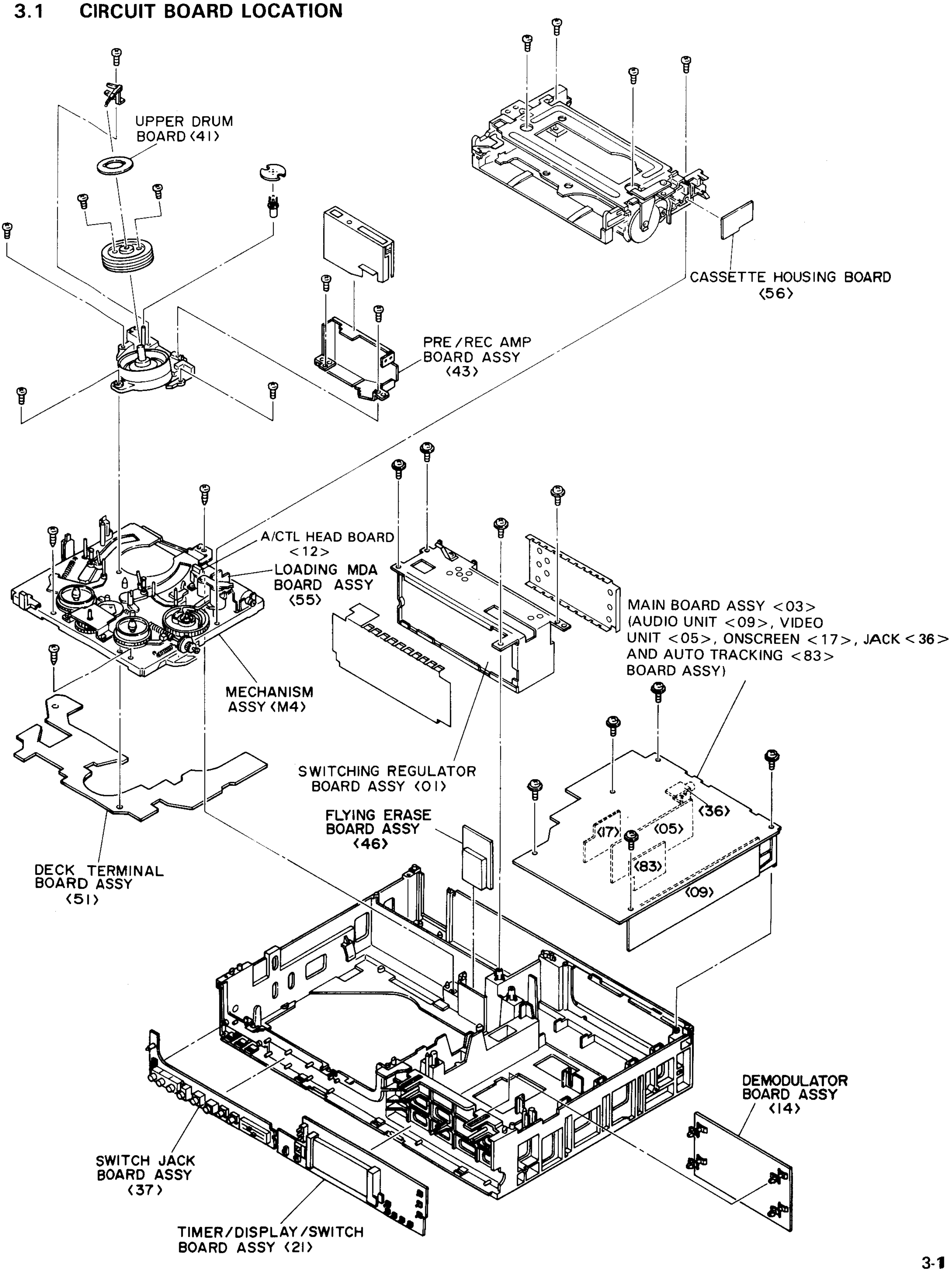
Note: *Unless otherwise specified, all test points and adjustments are located on the MAIN board.*

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
Equipment required: 1. Oscilloscope 2. IF sweep signal genrator with suitable markers (PIF, SIF, etc.) 3. Sweeper probe (sweep signal supply cable) as shown in Fig. 2-8-1.					 C : 1000P Shorter than 8 cm Out Shield Earth R: 75 Ω Shorter than 5 cm Sweeper probe **Fig. 2-8-1**
1	VCO	IC1 - 28  VCO and sweep signal (beat) **Fig. 2-8-2**	T2 (VCO)	• Sweep genrator out: 70 dBμ (45.75 MHz) • Tuner mode without antenna IN	1) Use a sweeper probe as shown in Fig. 2-8-1 and connect the sweep generator output to pin 1 of SAW 1. Adjust the sweep gain so that the waveform does not distort as observed with the oscilloscope. Connect the oscilloscope to pin 28 of IC1 (VIDEO DET OUT) and adjust T2 to align the waveform with the frequency marker as shown in Fig. 2-8-2.
				• TV broadcast • Tuner mode	**Alternate method:** 1) Receive a color broadcast on a VHF-HI channel (7 to 13). 2) Adjust T2 to obtain a fine picture on the monitor.
● **Before the following adjustments:** 1. Connect a cable to ANT IN and terminate TV OUT at 75 Ω. 2. Set a TV channel signal generator as follows. Video : 70 dBμ/75 Ω, color bar 87.5% modulation Audio : 62 dBμ/75 Ω, 1 kHz ± 25 kHz deviation					
2	RF AGC	IF terminal of Front end	R21 (RF AGC)	• TV signal • Tuner mode	1) Connect the oscilloscope to IF terminal of U/V Tuner (Front end). Adjust R21 for maximum level, then again adjust R21 for –8dB again.
		MONITOR	R21 (RF AGC)	• TV broadcast • Tuner mode	**Alternate method:** **Note:** Adjust R21 (RF AGC) to correct for excess noise in the picture or when streaky cross interference occurs due to strong electrical fields. 1) Adjust R21 to minimize noise or streaks on the TV screen. 2) Check for absence of abnormality on all channels.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
3	AFC	IC1-16	T3 (AFC)	• TV signal • Tuner mode	1) With AFC MODE to NORM, connect oscilloscope to IC1-16. 2) Set the oscilloscope to DC mode and adjust T3 to set the lower edge of the ripple waveform to 4.5 V.
				• TV broadcast • Tuner mode • AFC MODE: NORM	**Alternate method:** 1) Receive a color broadcast on a VHF-HI channel (7 to 13). 2) With AFC MODE to NORM, connect oscilloscope to IC1-16. 3) Set the oscilloscope to DC mode and adjust T3 to set the lower edge of the ripple waveform to 4.5 V.
4	Color Level	Q4-E	R40 (Color level)	• TV signal • Tuner mode	1. Supply a color bar signal on a VHF-HI channel (7 to 13) from a TV channel signal generator and select the channel corresponding to the generator. 2. With AFC mode to NORM, adjust R40 to produce signal waveform as shown in Fig. 2-8-3.
	 b a Y level = 1 Magenta level = 0.45 a : b = 1 : 0.45 Fig. 2-8-3			• TV broadcast • Tuner mode	**Alternate method:** 1. Receive a color broadcast on a VHF-HI channel (7 to 13). 2. With AFC mode to NORM, adjust R40 so that the magenta level becomes 2/3% of the sync. level.
5	SOUND DET (FM)	IC1-19	T4 (FM DET)	• TV signal • Tuner mode	1) Use a adjustment circuit as shown in Fig. 2-8-4 and with AFC SW to NORM, connect a distortion meter as shown in Fig. 2-8-4. 2) Adjust T4 for minimum distortion (less than 0.5%).
	 Fig. 2-8-4 Adjustment circuit				
		IC1-19	T4 (FM DET)	• TV broadcast • Tuner mode	**Alternate method:** 1) Receive a color broadcast on a VHF-HI channel (7 to 13). Connect an oscilloscope to IC1-19 of the IF (MAIN) board. 2) Adjust T4 for maximum level at audio sound.

SECTION 3
CHARTS AND DIAGRAMS

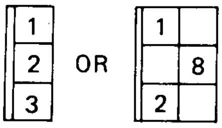
3.1 CIRCUIT BOARD LOCATION


UPPER DRUM BOARD <41>
CASSETTE HOUSING BOARD <56>
PRE/REC AMP BOARD ASSY <43>
A/CTL HEAD BOARD <12>
LOADING MDA BOARD ASSY <55>
MAIN BOARD ASSY <03> (AUDIO UNIT <09>, VIDEO UNIT <05>, ONSCREEN <17>, JACK <36> AND AUTO TRACKING <83> BOARD ASSY)
MECHANISM ASSY <M4>
SWITCHING REGULATOR BOARD ASSY <01>
<36>
<17>
<05>
<83>
<09>
FLYING ERASE BOARD ASSY <46>
DECK TERMINAL BOARD ASSY <51>
DEMODULATOR BOARD ASSY <14>
SWITCH JACK BOARD ASSY <37>
TIMER/DISPLAY/SWITCH BOARD ASSY <21>

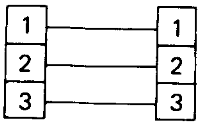
3.2 GENERAL INFORMATION

3.2.1 Connections

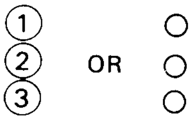
Note:
Unless otherwise specified, only signal input flow is indicated.
Connection arrows indicate only signal outputs.



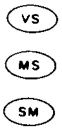
: Connectors



: Board in connectors



: Direct connections



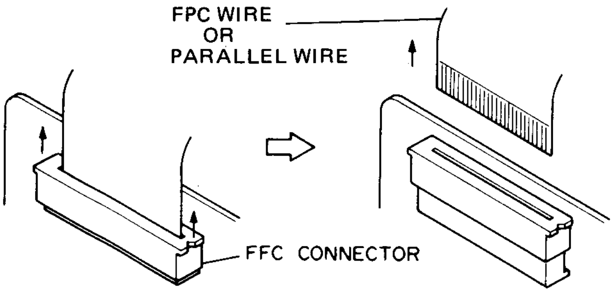
: Connected pattern in the board.
Abbreviations

V	: Video	M	:	Mechacon
S	: Servo	A	:	Audio

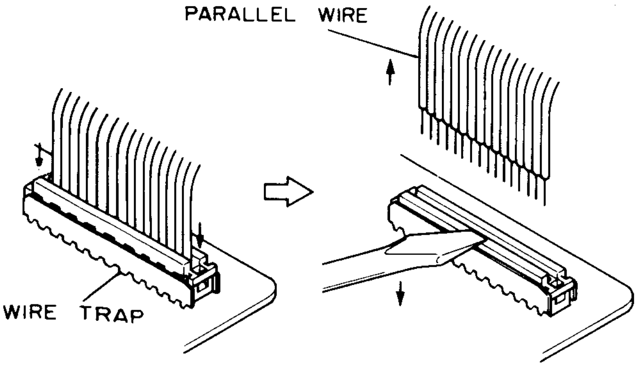
VS : Signal flow from video to servo.

3.2.2 Disconnecting the flatwire

1. Pull the connector structure upward to release the clamp when removing or inserting the flat wire cable.

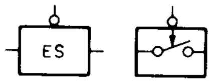


2. Depress the connector structure downward to release the clamp when removing or inserting the flat wire cable, as indicated below.

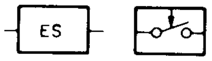


3.2.3 Indications

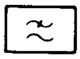
AUX : Active only at high.
$\overline{AUX}$: Active only at low.
$\bar{A}\bar{U}\bar{X}$: Active only at middle.
$\bar{A}U\bar{X}$: Active only at open.



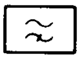
: Active only at low for electronic switch.



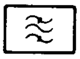
: Active only at high for electronic switch.



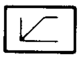
: Low pass filter.



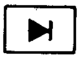
: High pass filter.



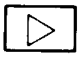
: Band pass filter.



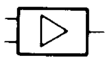
: Limiter.



: Detector



: Amplifier.



: Mixer stage.

3.2.4 Schematic diagram values

Unless otherwise specified.

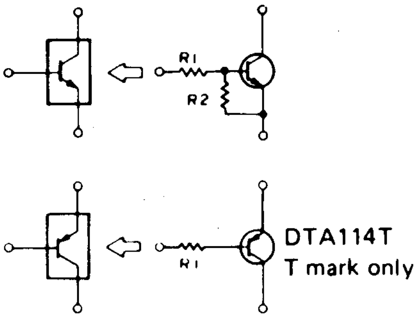
1. All resistance values are in ohms, 1/6 W, 1/8 W, (refer to parts list).
2. All capacitance values are in μF, (P; PF).
3. All inductance values are in μH, (m; mH).
4. All diodes are 1SS133 or MA165, (refer to parts list).
5. Voltages are DC-measured (reference to ground) with a digital voltmeter during recording (SP mode) and playback (SP mode) with alignment tape. Where voltages differ between recording and playback, the voltage during playback is shown in parentheses.
6. Waveforms (VIDEO System) are measured (reference to ground) with a color bar during recording (SP mode) and playback (SP mode) with alignment tape.
7. Waveforms (AUDIO System) are measured (reference to ground) with 1 kHz (−8 dBs) during recording and playback with alignment tape (1 kHz).
8. Shaded (▒) parts are critical for safety.
Replace only with specified parts numbers.

3.2.5 Signal flow in the schematic

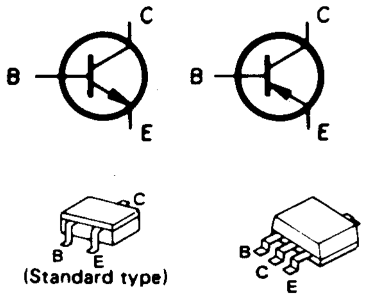
➡ Recording signal path
⇨ Playback signal path
⇨ REC/PB signal path

3.2.6 Semiconductors

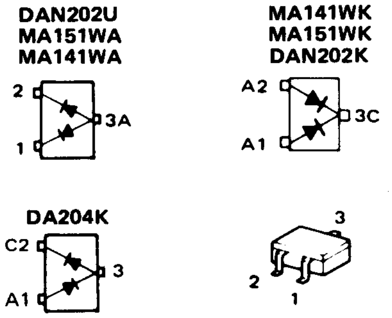
1. Digital transistor


R1
R2
R1
DTA114T
T mark only

2. Chip transistor


C
B
E
C
B
E
C
B E
(Standard type)
B
C
E

3. Chip diode


DAN202U
MA151WA
MA141WA
2
3A
1
MA141WK
MA151WK
DAN202K
A2
3C
A1
DA204K
C2
3
A1
3
2
1

Note:
The digital transistor includes built in resistors.
It features small size and high reliability.
Both PNP and NPN types are available.

Uses:
Inverter, Interface, driver circuits.

3.2.7 Replacement of chip parts

For replacing chip parts, proceed it as follows.
Use a well insulated fine-tipped soldering iron (approx. 17 W, 130°C ~ 260°C in temp.).
In addition, it is recommended to use a soldering iron (55 W approx.) with solder absorber for convenience.

Caution:
- Do not apply heat for more than 3 seconds.
- Do not rub electrodes.
- Do not reuse chips removed once. Discard them.
- Supplementary cementing is not required.

1. Soldered condition of chip parts

- Resistors, capacitors, etc.

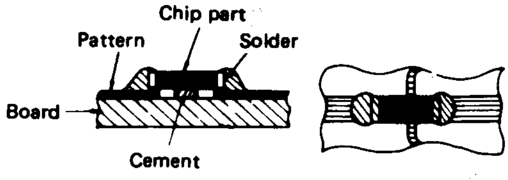

Chip part
Pattern
Solder
Board
Cement

Fig. 3-2-1 Soldering condition-1

- Transistors, diodes, etc.

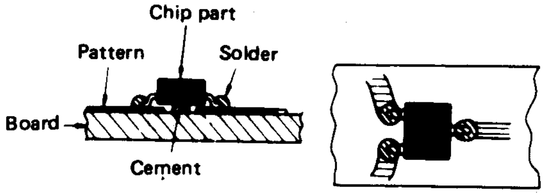

Chip part
Pattern
Solder
Board
Cement

Fig. 3-2-2 Soldering condition-2

2. How to remove chip parts

- Resistors, capacitors, etc.

1) Set a chip parts replacing tool onto the chip parts to hold it down.
2) Unsolder at a side of the chip parts.

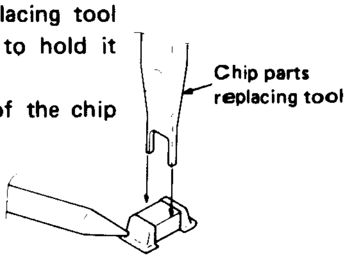

Chip parts replacing tool

Fig. 3-2-3 R/C removal-1

3) Remove the chip parts by twisting and sliding it.

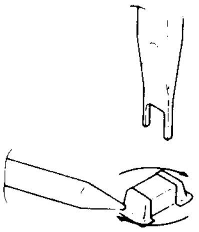


Fig. 3-2-4 R/C removal-2

3. How to remove transistors, diode.

1) Unsolder at the one-lead side of the chip parts.

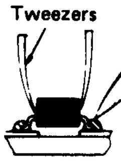


Fig. 3-2-5 Tr/Diode removal-1

2) Lift the unsoldered side upwards.

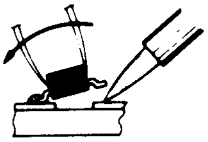


Fig. 3-2-6 Tr/Diode removal-2

3) Heat the other two leads simultaneously and remove the chip parts upwards.

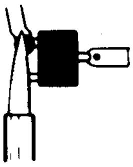


Fig. 3-2-7 Tr/Diode removal-3

4. Preheating and soldering

When setting new chip parts, especially capacitors, but except transistors, preheat them with hot air (150°C approx.) by use of a blower type of hair dryer for about 2 minutes just before soldering. For soldering, use a soldering iron of 30 watt approximately.

5. How to set and solder chip parts

1) Presolder the contact points of the circuit pattern to which the chip parts will be soldered.

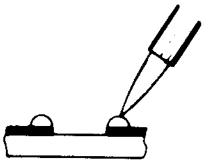


Fig. 3-2-8 Soldering-1

2) Holding down the chip parts with the chip parts replacing tool, solder it with a soldering iron.

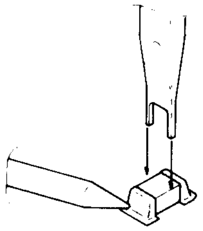


Fig. 3-2-9 Soldering-2

3.3 ABBREVIATIONS USED IN THE SCHEMATIC DIAGRAMS

A	AC	: Alternating Current
	ACC	: Automatic Color Control
	ACCEL	: Acceleration
	A/CTL	: Audio/Control
	ADC	: Analog to Digital Converter
	ADD	: Adder
	ADRS	: Address
	ADJ	: Adjustment
	A DUB	: Audio Dubbing
	AE	: Audio Erase
	AEF	: Automatic Editing Function
	AFC	: Automatic Frequency Control
	AFT	: Automatic Fine Tuning
	AGC	: Automatic Gain Control
	AH	: Audio Head
	AL	: After Loading
	ALC	: Automatic Light Compensation Automatic Level Control
	AM	: Amplitude Modulation
	AMP	: Amplifier
	ANT	: Antenna
	APC	: Automatic Pedestal Control Automatic Phase Control
	APL	: Average Picture Level
	A/S/M	: Audio/Servo/Mechacon
	ASS'Y	: Assembly
	ATT	: Attenuator
	AUD	: Audio
	AUTO	: Automatic
	AUX	: Auxiliary

B	B	: Base
	BAL	: Balance
	BATT	: Battery
	BFP	: Burst Flag Pulse
	BIT	: Binary Digit
	BLK	: Black, Blanking
	BLU	: Blue
	BILING	: Bilingual
	BPF	: Bandpass Filter
	BRK	: Brake
	BRN	: Brown
	BT	: Band Tuning
	BUFF	: Buffer
	BW or B/W	: Black and White

C	C	: Capacitance, Collector, Color
	CAP	: Capstan, Capacitor
	CAR	: Carrier
	CARR	: Carrier
	CASS	: Cassette
	CCD	: Charge Coupled Device
	CCT	: Circuit
	CD	: Count Down
	CE	: Chip Enable
	CF	: Ceramic Filter
	CH	: Channel
	CHG	: Charge
	CHROMA	: Chrominance
	CLK	: Clock
	CLR	: Clear
	CMD	: Command
	CNT	: Count, Counter
	COL	: Color
	COM	: Common
	COMB	: Combination Comb Filter
	COMP	: Comparator Composite Compensation
	CONN	: Connector
	CONV	: Converter
	CP	: Circuit Protector Clamp Pulse
	CPC	: Capstan Phase Control
	CTL	: Control

D	D	: Drum, Digital, Diode, Drain
	DAC	: Digital to Analog Converter
	dB	: Decibel
	DC	: Direct Current
	DEC	: Decoder
	DEMOD	: Demodulator
	DEMUX	: Demultiplexer
	DET	: Detector
	DEV	: Deviation
	DIF	: Differential
	DISCR	: Discriminator
	DL	: Delay Line
	DOC	: Dropout Compensator
	DOD	: Drop Out Detector
	DPC	: Drum Phase Control

E	E	: Edit, Emitter
	E-E	: Electric to Electric
	EF	: Emitter-Follower
	EMP	: Emphasis
	EN	: Enable
	ENC	: Encoder
	ENV	: Envelope
	EP	: Extended Play
	EQ	: Equalizer
	ES	: Electronic Switch
	ESNS	: End Sensor
	EXP	: Expander
	EXT	: External

F	F	: Farad, Fuse
	F ADV	: Frame Advance
	FDP	: Fluorescent Display Panel
	FE	: Full Erase
	FET	: Field Effect Transistor
	FF	: Fast Forward Flipflop
	FG	: Frequency Generator
	FM	: Frequency Modulation
	FMA	: FM Audio
	FR	: Full Recording, Frame, Fusible Resistor
	FREQ	: Frequency
	F-V CONV	: Frequency to Voltage Converter
	FWD	: Forward
	FWD S	: Forward Search

G	G	: Green, Gate, Grid
	GEN	: Generator
	GND	: Ground
	GRN	: Green
	GRY	: Gray

H	H	: High, Henry, Hour
	HG	: Hall Generator
	HPF	: Highpass Filter
	Hz	: Herz

I	IC	: Integrated Circuit
	ID	: Identification (Pulse)
	IF	: Intermediate Frequency
	IFR	: Infrared
	IFT	: Intermediate Frequency Transformer
	IND	: Indicator
	INH	: Inhibit
	INS	: Insert
	INT	: Internal, Interrupt
	INV	: Inverter
	I/O	: Input/Output
	IR	: Infrared

L	L	: Low, Left
	LIM	: Limiter
	LIN	: Linearity
	LOAD	: Loading (Cassette)
	LP	: Long Play
	LPF	: Lowpass Filter

M	M	: Motor, Mega
	MAX	: Maximum
	MDA	: Motor Drive Amplifier
	MECHACON	: Mechanism Control
	MI	: Multiintroduce
	MIC	: Microphone
	MIN	: Minimum
	MIX	: Mixer, Mixing
	MMV	: Monostable Multivibrator
	MOD	: Modulation, Modulator
	MODEM	: Modulator-Demodulator
	MON	: Monitor
	MPX	: Multiplexer, Multiplex
	MS	: Mode Select
N	NAND	: Not-And
	NC	: Not Connected, Normally Closed
	NFB	: Negative Feedback
	NLN	: Non-Linear
	NO	: Normally Open
	NOR	: Normal, Not-Or
	NR	: Noise Reduction
O	OP	: Operation
	OPAMP	: Operational Amplifier
	ORN	: Orange
	OSC	: Oscillator
P	PB	: Playback
	PC	: Photocoupler, Pulse Counter
	PCM	: Pulse Code Modulation
	PG	: Pulse Generator
	PGM	: Program
	PI	: Photo Interrupter
	PIF	: Picture Intermediate Frequency
	PLA	: Programmable Logic Array
	PLL	: Phase Locked Loop
	POS	: Position
	p-p	: Peak-to-Peak
	PREAMP	: Preamplifier
	P/S	: Pause/Still
	PSC	: Pulse Swallowing Control
	PU	: Pickup
	PUT	: Programmable Unijunction Transistor
	PWM	: Pulse Width Modulation
	PWR	: Power
Q	Q	: Quality Factor
R	R	: Red, Right
	RA	: Resistor Array
	RAE	: Random Access Enable
	RAM	: Random Access Memory
	REC	: Recording
	REF	: Reference
	REG	: Regulated, Regulator
	REM	: Remote
	REMOCON	: Remote Control (Unit)
	REV	: Reverse
	REV S	: Reverse Search
	REW	: Rewind
	R/P	: Record/Playback
	RPT	: Repeat
	RST	: Reset
	RT	: Rotary Transformer
	RUN	: Running
	RY	: Relay
S	SAW	: Sawtooth, Surface Acoustic Wave
	SC	: Subcarrier, Simulcast
	SCH	: Search
	SEL	: Select, Selector
	SENS	: Sensor
	SEP	: Separator
	SF	: Source Follower
	SFF	: Short Fast Forward
	SIF	: Sound Intermediate Frequency
	SHARP	: Sharpness
	SN	: Signal to Noise Ratio
	SOL	: Solenoid
	SP	: Standard Play
	SREV	: Search Reverse
	SREW	: Short Rewind
	S/S	: Slow/Still
	SSG	: Sync Signal Generator
	SSNS	: Start Sensor
	STD	: Strobe Data, Standard
	SUP	: Supply
	SW	: Switch
	SWD	: Switched
	SYNC	: Synchronization
T	TF	: Thermal Fuse
	TIM	: Timing
	TK	: Tracking
	TNR	: Tuner
	TP	: Test Point
	TPZD	: Trapezoid
	TR	: Transistor, Trimmer
	TRANS	: Transformer
	TU	: Take-up
U	UL	: Unloading
	UNREG	: Unregulated
	UNSW	: Unswitched
V	V	: Vertical, Volt
	VCO	: Voltage Controlled Oscillator
	VD	: Vertical Drive
	VIF	: Video Intermediate Frequency
	VLT	: Violet
	VR	: Variable Resistor
	VS	: Video and Sync
	V/T	: Video/Television
	V/U	: VHF/UHF
	VXO	: Variable Crystal Oscillator
W	W	: Watt
	W & D	: White and Dark
	WHT	: White
X	XTAL	: Crystal
Y	Y	: Luminance
	YEL	: Yellow

3.4 MAIN TYPES OF ACTIVE AND PACKAGE CIRCUITS

IC

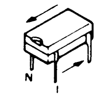
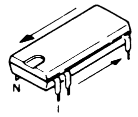
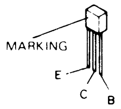
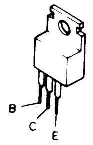
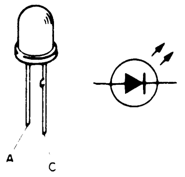
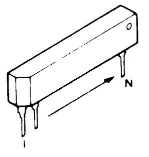
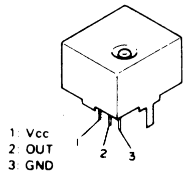
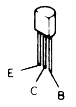
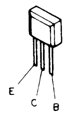
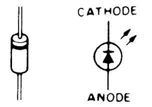
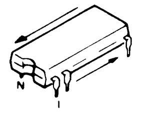
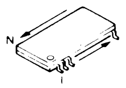
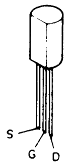
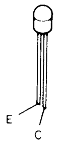
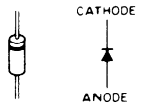
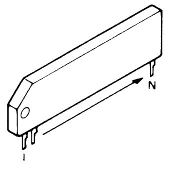
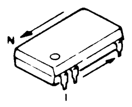
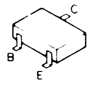
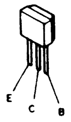
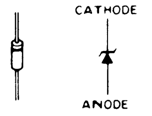
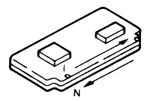
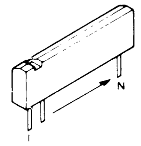
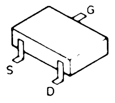
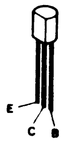
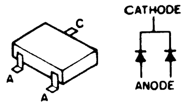
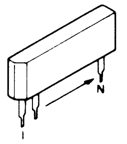
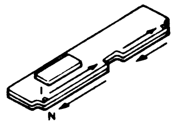
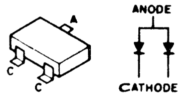
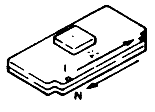
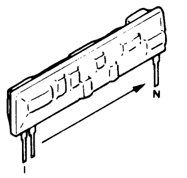
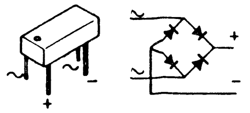
	NAME	L
A	AN33080NK	2A
	AN3386NK-A	3A
B	BA10324	1B
	BA6305	5B
	BA6418N	5B
	BA7233	1B
	BU4013B	1B
	BX7534B, C	7B
	BA6251	5B
	BA15128	3A
C	CAT93C46P	7B
	CAX1126S	5A
G	GP1U541X	2B
H	HA118125NT	1B
	HD404729RY12S	4B
	HD404729S9Y12S	4B
	HD49733NT	4B
M	MC14066BCP	3B
	MSC1198SS	1B
	MSM6866RS	4B
	M37418M6-212SP	3A
	M37418M6-205SP	3A
	M50253P	3A
	M50554-168SP	3A
	M51365SP	3A
	M52684AP	1A
	M37419M8-112SP	3A
P	PB20166A-01	7A
	PB20167B-01	7A
S	SN74HCU04N	1B
U	UPC1870CA	1B

TRANSISTOR

	NAME	L
DTA	DTA1132U	4C
	DTA114EU	4C
	DTA123EU	4C
	DTA124EU	4C
	DTA144ES	2D
	DTA144EU	4C
	DTA144TU	4C
	DTA144WU	4C
DTB	DTB114ES	2D
DTC	DTC114EU	4C
	DTC124EK	4C
	DTC124EU	4C
	DTC124TU	4C
	DTC143EU	4C
	DTC143TU	4C
	DTC144EU	4C
	DTC144WU	4C
P	PN268VI-NC	4D
2SA	2SA1576(QRS)	4C
	2SA1576(RS)	4C
	2SA1576(S)	4C
	2SA1577(QR)	4C
	2SA1577(PQR)	4C
	2SA933S	5C
	2SA933S(Q)	5C
	2SA933S(S)	5C
	2SA720	2C
2SB	2SB1030AR,S	1C
	2SB1218A(RS)	4C
	2SB1425(ED)	5D
	2SB1425(EU)	5D
	2SB941P	1D
2SC	2SC1740(QRS)	2C
	2SC1740S(Q)	2C
	2SC1740S(RS)	2C
	2SC1740S(S)	2C
	2SC1741S(QR)	2C
	2SC3243D,E	5D
	2SC3311A(RS)	1C
	2SC3311A(S)	1C
	2SC3616(MLK)	5D
	2SC3936(BC)	4C
	2SC4081(QR)	4C
	2SC4081(QRS)	4C
	2SC4081(RS)	4C
	2SC4081(S)	4C
	2SC4097(QR)	4C
	2SC4098(PQ)	4C
	2SC4130	1D
2SD	2SD1328S,T	4C
	2SD1450S,T	1C
	2SD1468S(SR)	5C
2SK	2SK665	5C

DIODE

	NAME	L
A	AG01	3E
	AU01	3E
	AU012	3E
D	DAN202U	5E
	DAP202U	6E
H	HZ2BLL	4E
L	LTZ-MR15	2E
M	MA141K	3E
	MA141WA	6E
	MA141WK	5E
	MA165	3E
	MTZV6.2A	4E
	MTZ108	4E
	MTZ5.1CT-22	4E
R	RD15ES-T1B3	4E
	RD30ES-T1B1	4E
	RD6.8ES-T1B1	4E
	RD8.2ES-T1B1	4E
	RD9.1ES-T1B3	4E
	RL4Z-LFK2	3E
S	SLH-34MC3F	1E
	SLH-34VC3F	1E
U	UZ8.2BSC	4E
	UZ9.1BSB	4E
1	1SS132	3E
	1SS133	3E
	1SS292	3E
	11EFS2	3E
	11ES2	3E
D	DF04M	7E

	Integrated Circuit		Transistor		Diode
	A	B	C	D	E
1					
2					
3					
4					
5					
6					
7					
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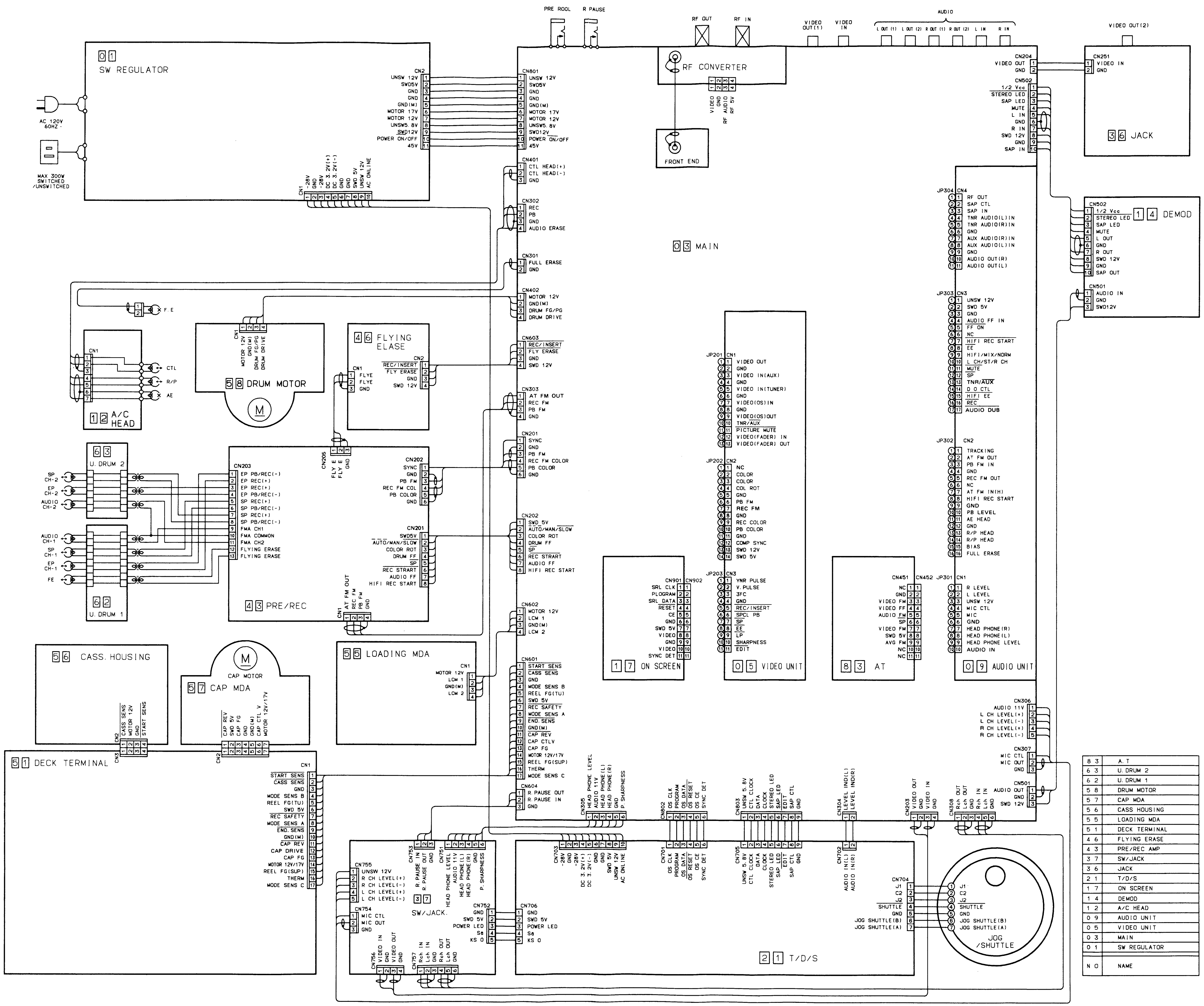
9					

3.5 BOARD INTERCONNCETION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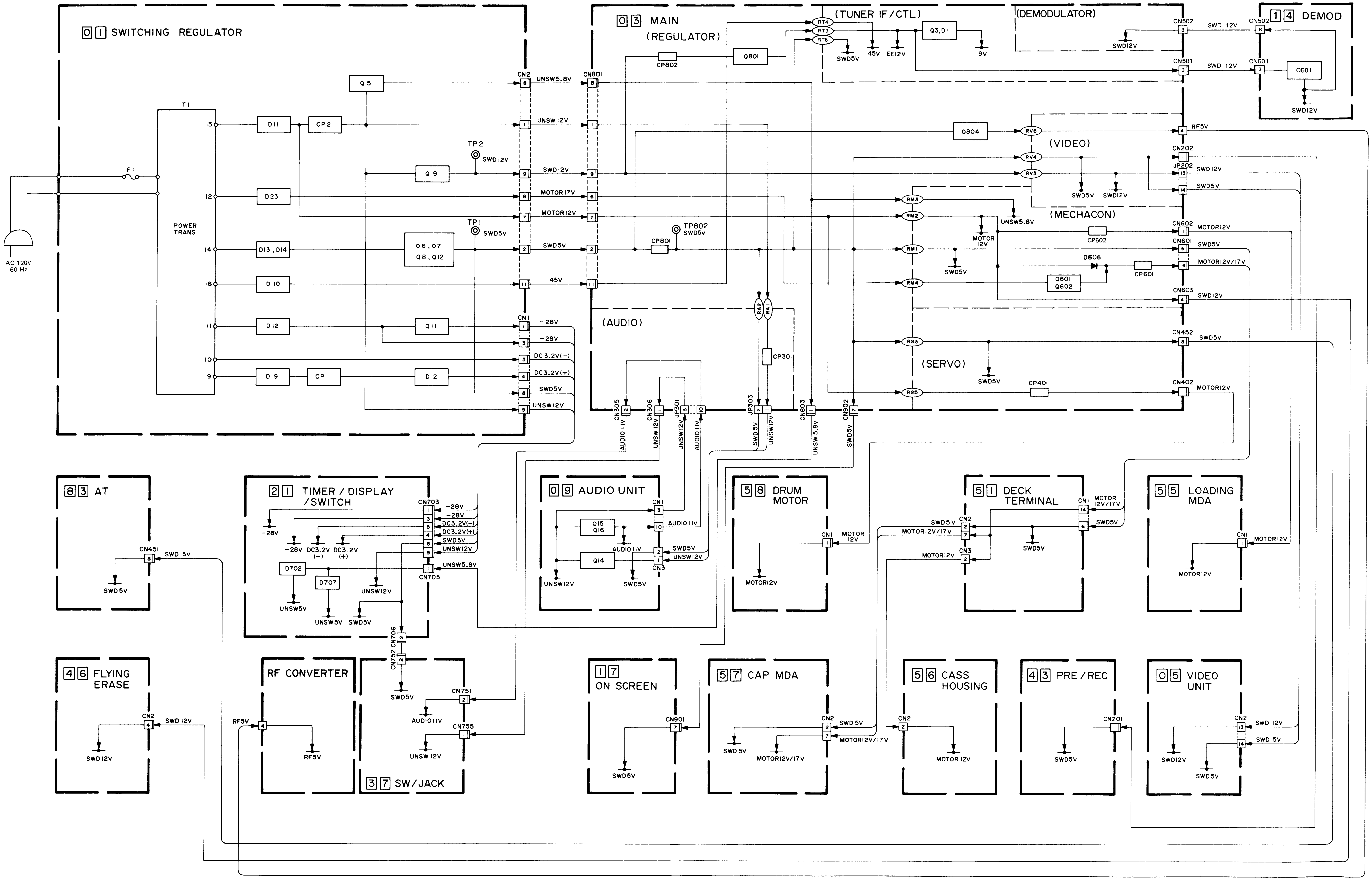
AC 120V 60HZ
MAX 300W SWITCHED /UNSWITCHED
CN2
UNSW 12V
SWD5V
GND
GND
GND(M)
MOTOR 17V
MOTOR 12V
UNSW5.8V
SWD12V
POWER ON/OFF
45V
CN1
-28V
GND
-28V
DC 3.2V(+)
DC 3.2V(-)
GND
GND
SWD 5V
UNSW 12V
AC ONLINE
PRE ROOL
R PAUSE
RF OUT
RF IN
RF CONVERTER
VIDEO
GND
RF AUDIO
RF 5V
FRONT END
VIDEO OUT(1)
VIDEO IN
AUDIO
L OUT (1)
L OUT (2)
R OUT (1)
R OUT (2)
L IN
R IN
VIDEO OUT(2)
CN801
CN401
CTL HEAD(+)
CTL HEAD(-)
CN302
REC
PB
AUDIO ERASE
CN301
FULL ERASE
CN402
DRUM FG/PG
DRUM DRIVE
CN603
REC/INSERT
FLY ERASE
SWD 12V
CN303
AT FM OUT
REC FM
PB FM
CN201
SYNC
PB FM
REC FM COLOR
PB COLOR
CN202
AUTO/MAN/SLOW
COLOR ROT
DRUM FF
SP
REC STRART
AUDIO FF
HIFI REC START
CN602
LCM 1
LCM 2
CN601
START SENS
CASS SENS
MODE SENS B
REEL FG(TU)
REC SAFETY
MODE SENS A
END. SENS
CAP REV
CAP CTLV
CAP FG
MOTOR 12V/17V
REEL FG(SUP)
THERM
MODE SENS C
CN604
R.PAUSE OUT
R.PAUSE IN
0 3 MAIN
CN204
VIDEO OUT
CN502
1/2 Vcc
STEREO LED
SAP LED
MUTE
L IN
R IN
SWD 12V
SAP IN
CN251
VIDEO IN
3 6 JACK
1 4 DEMOD
L OUT
R OUT
SAP OUT
CN501
AUDIO IN
SWD12V
F E
CN1
CTL
R/P
AE
1 2 A/C HEAD
5 8 DRUM MOTOR
MOTOR 12V
GND(M)
DRUM FG/PG
DRUM DRIVE
4 6 FLYING ELASE
FLYE
6 3 U. DRUM 2
SP CH-2
EP CH-2
AUDIO CH-2
AUDIO CH-1
SP CH-1
EP CH-1
FE
6 2 U. DRUM 1
CN203
EP PB/REC(-)
EP REC(+)
EP REC(+)
EP PB/REC(-)
SP REC(+)
SP PB/REC(-)
SP REC(+)
SP PB/REC(-)
FMA CH1
FMA COMMON
FMA CH2
FLYING ERASE
FLYING ERASE
CN205
CN202
REC FM COL
CN201
SWD5V
4 3 PRE/REC
JP201 CN1
VIDEO OUT
VIDEO IN(AUX)
VIDEO IN(TUNER)
VIDEO(OS)IN
VIDEO(OS)OUT
TNR/AUX
PICTURE MUTE
VIDEO(FADER) IN
VIDEO(FADER) OUT
JP202 CN2
NC
COLOR
COL ROT
REC COLOR
COMP SYNC
JP203 CN3
YNR PULSE
V.PULSE
3FC
SPCL PB
EE
LP
SHARPNESS
EDIT
0 5 VIDEO UNIT
CN901 CN902
SRL CLK
PLOGRAM
SRL DATA
RESET
CE
1 7 ON SCREEN
CN451 CN452
VIDEO FM
VIDEO FF
AUDIO FM
AVG FM
8 3 AT
JP304 CN4
RF OUT
SAP CTL
TNR AUDIO(L)IN
TNR AUDIO(R)IN
AUX AUDIO(R)IN
AUX AUDIO(L)IN
AUDIO OUT(R)
AUDIO OUT(L)
JP303 CN3
AUDIO FF IN
FF ON
HIFI REC START
HIFI/MIX/NORM
L CH/ST/R CH
TNR/AUX
D O CTL
HIFI EE
AUDIO DUB
JP302 CN2
TRACKING
AT FM OUT
PB FM IN
REC FM OUT
AT FM IN(H)
HIFI REC START
PB LEVEL
AE HEAD
R/P HEAD
BIAS
FULL ERASE
JP301 CN1
R LEVEL
L LEVEL
MIC CTL
MIC
HEAD PHONE(R)
HEAD PHONE(L)
HEAD PHONE LEVEL
AUDIO IN
0 9 AUDIO UNIT
CN306
AUDIO 11V
L CH LEVEL(+)
L CH LEVEL(-)
R CH LEVEL(+)
R CH LEVEL(-)
CN307
MIC OUT
5 6 CASS. HOUSING
CAP MOTOR
5 7 CAP MDA
5 5 LOADING MDA
5 1 DECK TERMINAL
CN305
CN802
OS CLK
PROGRAM
OS DATA
OS RESET
OS CE
SYNC DET
CN803
UNSW 5.8V
CTL CLOCK
DATA
CLOCK
STEREO LED
SAP LED
EDIT
SAP CTL
CN304
LEVEL IND(L)
LEVEL IND(R)
CN203
CN308
CN755
CN754
CN753
CN751
CN752
3 7 SW/JACK
SWD 5V
POWER LED
Sa
KS O
CN756
CN757
CN703
CN701
CN705
CN702
AUDIO IN(L)
AUDIO IN(R)
CN704
J1
C2
J2
SHUTTLE
JOG SHUTTLE(B)
JOG SHUTTLE(A)
CN706
2 1 T/D/S
JOG /SHUTTLE

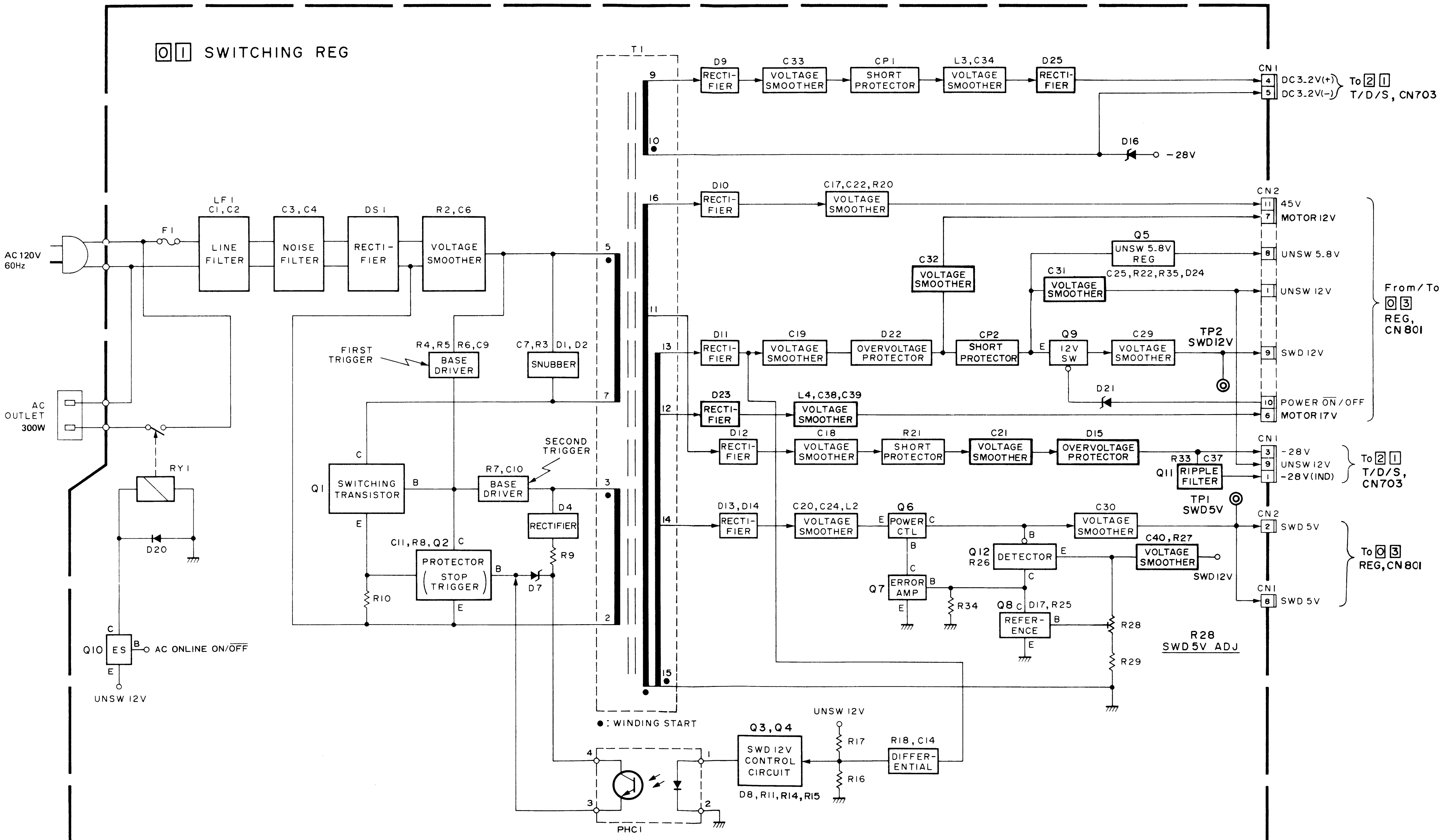
8 3	A. T
6 3	U. DRUM 2
6 2	U. DRUM 1
5 8	DRUM MOTOR
5 7	CAP MDA
5 6	CASS HOUSING
5 5	LOADING MDA
5 1	DECK TERMINAL
4 6	FLYING ERASE
4 3	PRE/REC AMP
3 7	SW/JACK
3 6	JACK
2 1	T/D/S
1 7	ON SCREEN
1 4	DEMOD
1 2	A/C HEAD
0 9	AUDIO UNIT
0 5	VIDEO UNIT
0 3	MAIN
0 1	SW REGULATOR
N O	NAME

3.6 POWER SYSTEM BLOCK DIAGRAM

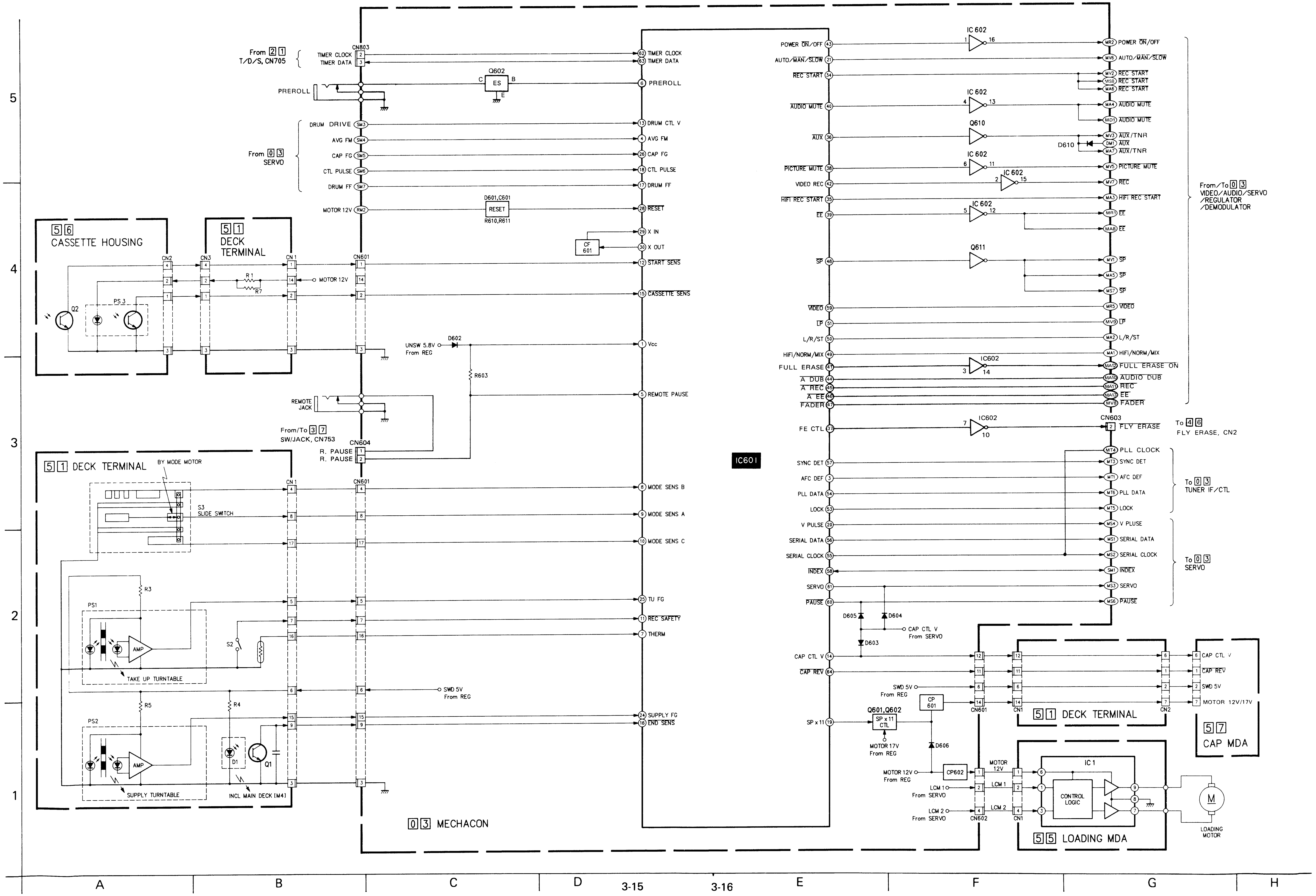


01 SWITCHING REGULATOR
T1
F1
POWER TRANS
AC 120V 60 Hz
D11
CP2
D23
D13, D14
D10
D12
D9
CP1
D2
Q5
Q9
Q6, Q7 Q8, Q12
Q11
TP2 SWD12V
TP1 SWD5V
CN2
CN1
UNSW5.8V
UNSW12V
SWD12V
MOTOR17V
MOTOR12V
SWD5V
45V
-28V
DC3.2V(-)
DC3.2V(+)
03 MAIN (REGULATOR)
CN801
CP802
Q801
CP801
TP802 SWD5V
(TUNER IF/CTL)
RT4
RT3
RT6
Q3, D1
EE12V
9V
(DEMODULATOR)
CN502
CN501
SWD 12V
14 DEMOD
Q501
Q804
RV6
RV4
RV3
(VIDEO)
CN202
JP202
RF5V
(MECHACON)
RM3
RM2
RM1
RM4
MOTOR 12V
CP602
D606
Q601 Q602
CP601
CN602
CN601
CN603
MOTOR12V/17V
(AUDIO)
RA2
RA1
CP301
(SERVO)
RS3
RS5
CP401
CN452
CN402
CN305
CN306
JP301
JP303
CN803
CN902
AUDIO 11V
UNSW 5.8V
83 AT
CN451
SWD 5V
21 TIMER / DISPLAY /SWITCH
CN703
CN705
D702
D707
UNSW5V
CN706
CN752
09 AUDIO UNIT
Q15 Q16
Q14
CN3
58 DRUM MOTOR
MOTOR 12V
51 DECK TERMINAL
MOTOR 12V/17V
55 LOADING MDA
46 FLYING ERASE
RF CONVERTER
37 SW/JACK
CN751
CN755
17 ON SCREEN
CN901
57 CAP MDA
56 CASS HOUSING
43 PRE / REC
CN201
05 VIDEO UNIT
A
B
C
D
E
F
G
H
1
2
3
4
5
6

3.7 SWITCHING REGULATOR BLOCK DIAGRAM

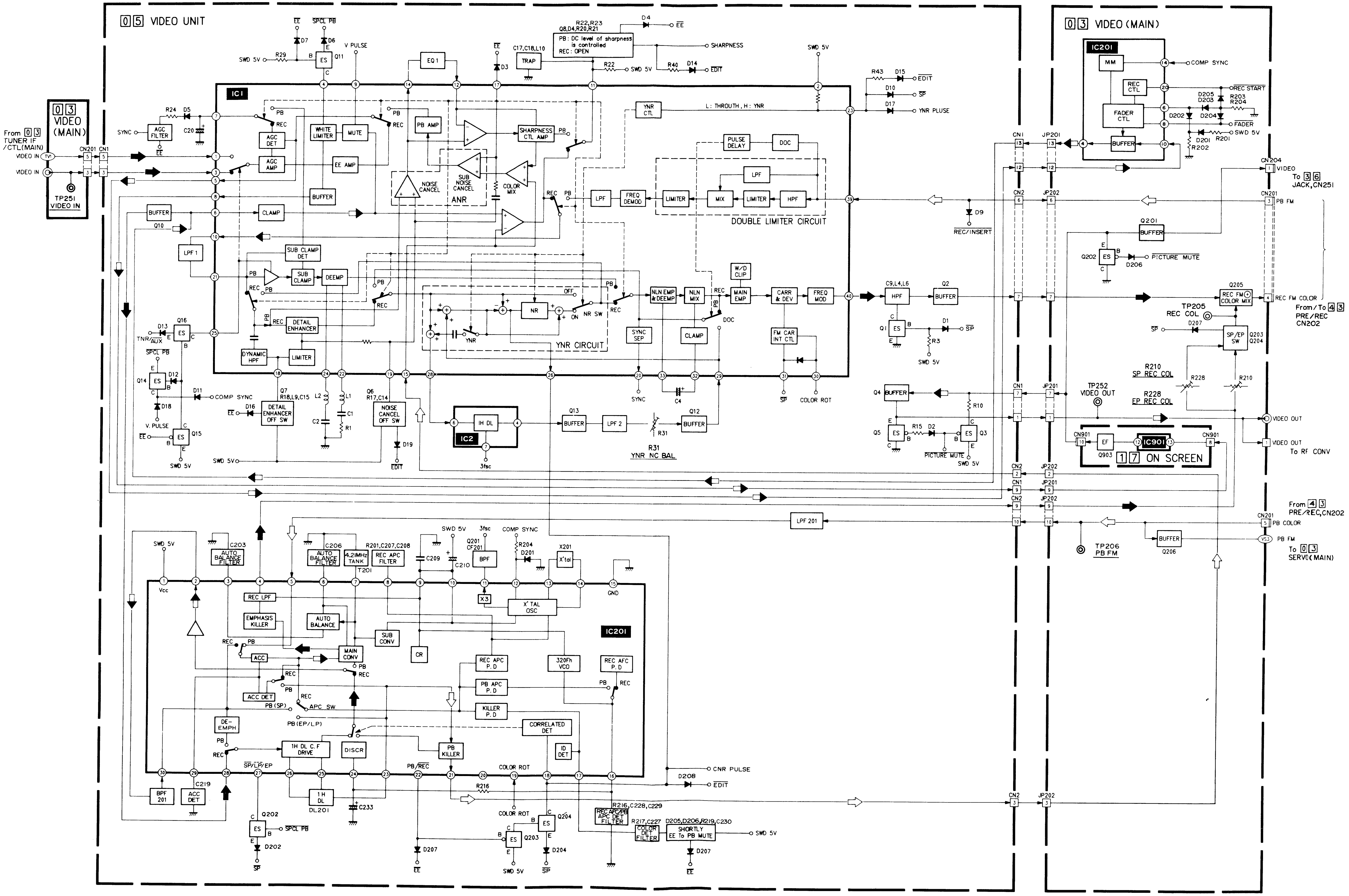

01 SWITCHING REG
AC 120V 60Hz
AC OUTLET 300W
F1
LF1 C1, C2 LINE FILTER
C3, C4 NOISE FILTER
DS1 RECTI-FIER
R2, C6 VOLTAGE SMOOTHER
FIRST TRIGGER
R4, R5 R6, C9 BASE DRIVER
C7, R3 D1, D2 SNUBBER
SECOND TRIGGER
R7, C10 BASE DRIVER
Q1 SWITCHING TRANSISTOR
C B E
C11, R8, Q2 PROTECTOR (STOP TRIGGER)
D4 RECTIFIER
R9
D7
R10
RY1
D20
Q10 ES
AC ONLINE ON/OFF
UNSW 12V
T1
9 10 16 11 13 12 14 15 5 7 3 2
●: WINDING START
D9 RECTI-FIER
C33 VOLTAGE SMOOTHER
CP1 SHORT PROTECTOR
L3, C34 VOLTAGE SMOOTHER
D25 RECTI-FIER
D16 -28V
CN1 4 DC3.2V(+) 5 DC3.2V(-)
To 21 T/D/S, CN703
D10 RECTI-FIER
C17, C22, R20 VOLTAGE SMOOTHER
CN2 11 45V 7 MOTOR 12V
Q5 UNSW 5.8V REG
8 UNSW 5.8V
C32 VOLTAGE SMOOTHER
C31 VOLTAGE SMOOTHER
C25, R22, R35, D24
1 UNSW 12V
From/To 03 REG, CN801
D11 RECTI-FIER
C19 VOLTAGE SMOOTHER
D22 OVERVOLTAGE PROTECTOR
CP2 SHORT PROTECTOR
Q9 12V SW
C29 VOLTAGE SMOOTHER
TP2 SWD12V
9 SWD 12V
D21
10 POWER ON/OFF
D23 RECTI-FIER
L4, C38, C39 VOLTAGE SMOOTHER
6 MOTOR 17V
D12 RECTI-FIER
C18 VOLTAGE SMOOTHER
R21 SHORT PROTECTOR
C21 VOLTAGE SMOOTHER
D15 OVERVOLTAGE PROTECTOR
R33 C37
Q11 RIPPLE FILTER
CN1 3 -28V 9 UNSW 12V 1 -28V(IND)
To 21 T/D/S, CN703
TP1 SWD5V
D13, D14 RECTI-FIER
C20, C24, L2 VOLTAGE SMOOTHER
Q6 POWER CTL
C30 VOLTAGE SMOOTHER
CN2 2 SWD 5V
Q12 R26 DETECTOR
C40, R27 VOLTAGE SMOOTHER
SWD12V
CN1 8 SWD 5V
To 03 REG, CN801
Q7 ERROR AMP
R34
Q8 D17, R25 REFER-ENCE
R28
R29
R28 SWD5V ADJ
UNSW 12V
R17
R16
Q3, Q4 SWD 12V CONTROL CIRCUIT
D8, R11, R14, R15
R18, C14 DIFFER-ENTIAL
PHC1
4 3 1 2

3.8 SYSTEM CONTROL BLOCK DIAGRAM

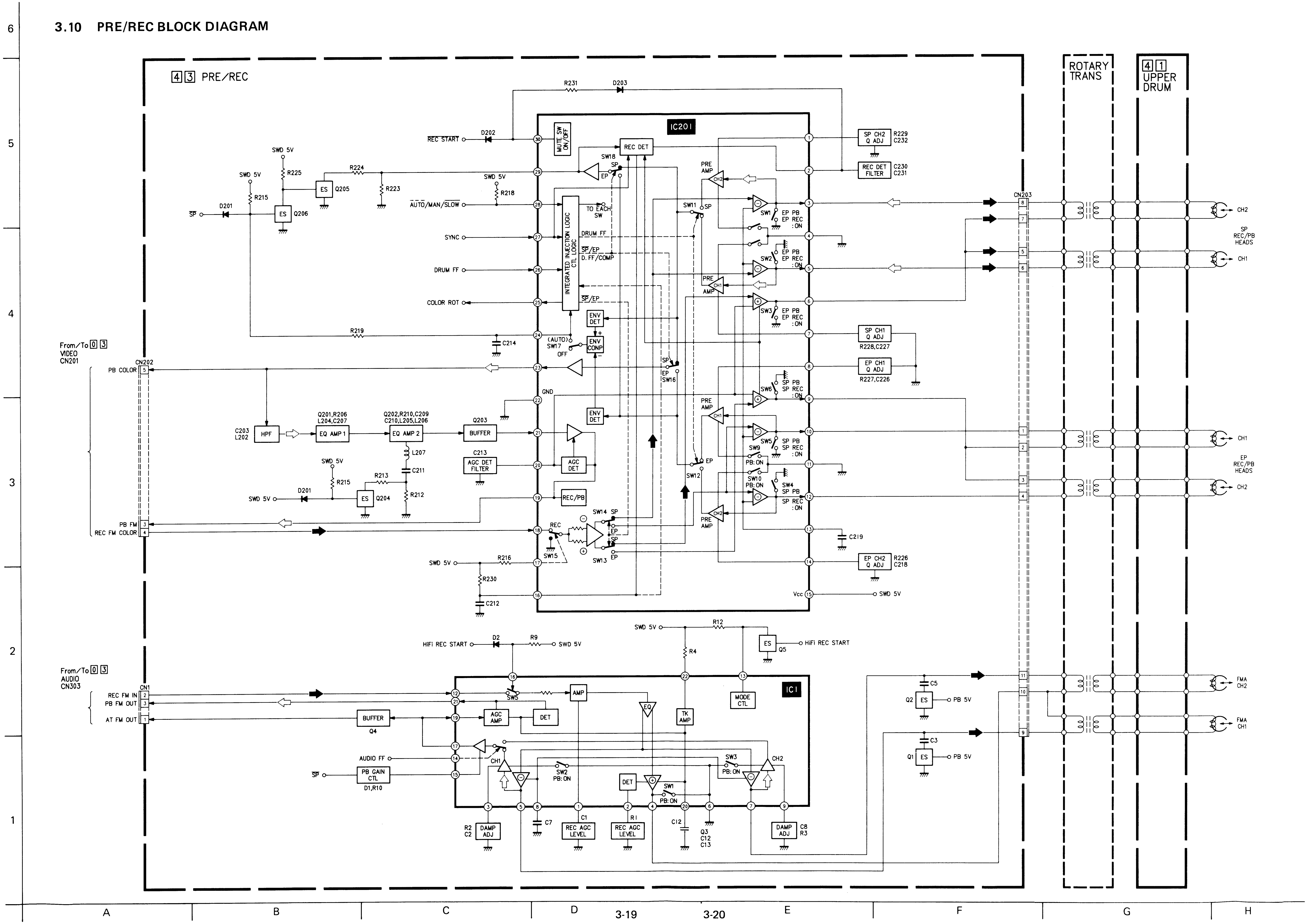


From 2 1
T/D/S, CN705
TIMER CLOCK
TIMER DATA
CN803
PREROLL
Q602
ES
From 0 3
SERVO
DRUM DRIVE
AVG FM
CAP FG
CTL PULSE
DRUM FF
MOTOR 12V
D601,C601
RESET
R610,R611
CF 601
5 6
CASSETTE HOUSING
5 1
DECK TERMINAL
CN2
CN3
CN1
CN601
Q2
PS3
R1
R7
MOTOR 12V
UNSW 5.8V
From REG
D602
R603
REMOTE JACK
From/To 3 7
SW/JACK, CN753
CN604
R. PAUSE
R. PAUSE
5 1 DECK TERMINAL
BY MODE MOTOR
S3
SLIDE SWITCH
R3
PS1
AMP
TAKE UP TURNTABLE
S2
R5
R4
PS2
D1
Q1
SUPPLY TURNTABLE
INCL MAIN DECK [M4]
SWD 5V
From REG
0 3 MECHACON
IC601
TIMER CLOCK
TIMER DATA
PREROLL
DRUM CTL V
AVG FM
CAP FG
CTL PULSE
DRUM FF
RESET
X IN
X OUT
START SENS
CASSETTE SENS
Vcc
REMOTE PAUSE
MODE SENS B
MODE SENS A
MODE SENS C
TU FG
REC SAFETY
THERM
SUPPLY FG
END SENS
POWER ON/OFF
AUTO/MAN/SLOW
REC START
AUDIO MUTE
AUX
PICTURE MUTE
VIDEO REC
HIFI REC START
EE
SP
VIDEO
LP
L/R/ST
HiFi/NORM/MIX
FULL ERASE
A DUB
A REC
A EE
FADER
FE CTL
SYNC DET
AFC DEF
PLL DATA
LOCK
V PULSE
SERIAL DATA
SERIAL CLOCK
INDEX
SERVO
PAUSE
CAP CTL V
CAP REV
SP x 11
IC 602
Q610
Q611
D610
IC602
CN603
POWER ON/OFF
AUTO/MAN/SLOW
REC START
REC START
REC START
AUDIO MUTE
AUDIO MUTE
AUX/TNR
AUX
AUX/TNR
PICTURE MUTE
REC
HIFI REC START
EE
EE
SP
SP
SP
VIDEO
LP
L/R/ST
HiFi/NORM/MIX
FULL ERASE ON
AUDIO DUB
REC
EE
FADER
From/To 0 3
VIDEO/AUDIO/SERVO
/REGULATOR
/DEMODULATOR
FLY ERASE
To 4 6
FLY ERASE, CN2
PLL CLOCK
SYNC DET
AFC DEF
PLL DATA
LOCK
To 0 3
TUNER IF/CTL
V PLUSE
SERIAL DATA
SERIAL CLOCK
INDEX
SERVO
PAUSE
To 0 3
SERVO
D605
D604
D603
CAP CTL V
From SERVO
SWD 5V
From REG
CP 601
Q601,Q602
SP x 11 CTL
MOTOR 17V
From REG
D606
MOTOR 12V
From REG
CP602
LCM 1
From SERVO
LCM 2
From SERVO
CN602
MOTOR 12V
LCM 1
LCM 2
CN1
5 1 DECK TERMINAL
CN2
CAP CTL V
CAP REV
SWD 5V
MOTOR 12V/17V
5 7
CAP MDA
IC 1
CONTROL LOGIC
5 5 LOADING MDA
M
LOADING MOTOR
5
4
3
2
1
A
B
C
D
E
F
G
H

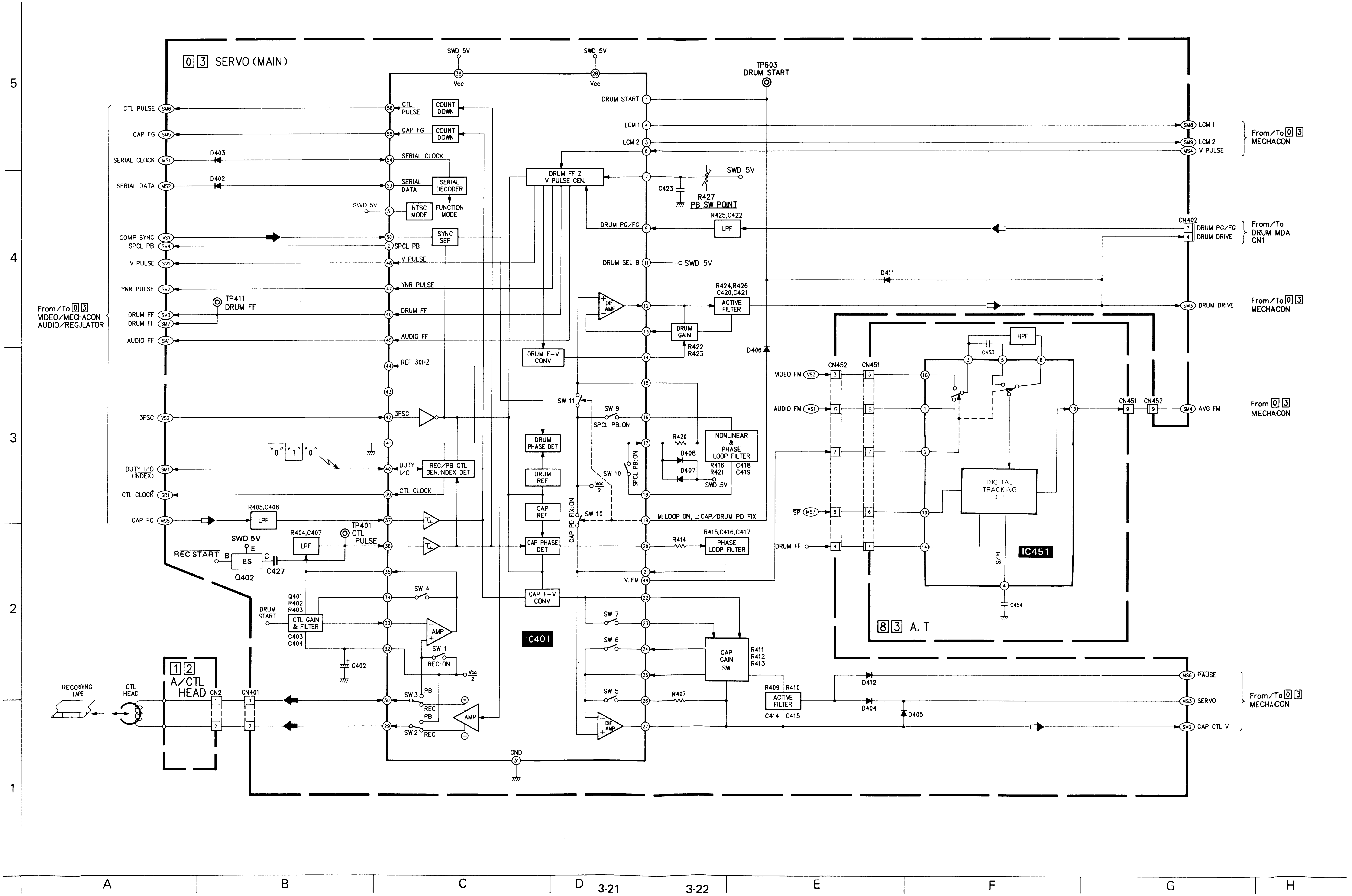
3.9 VIDEO BLOCK DIAGRAM


05 VIDEO UNIT
03 VIDEO (MAIN)
03 VIDEO (MAIN)
From 03 TUNER IF /CTL(MAIN)
VIDEO IN
TP251 VIDEO IN
CN201
CN1
SYNC
AGC FILTER
R24
D5
C20
IC1
PB
REC
AGC DET
AGC AMP
WHITE LIMITER
MUTE
EE AMP
BUFFER
PB AMP
NOISE CANCEL
SUB NOISE CANCEL
ANR
COLOR MIX
SHARPNESS CTL AMP
CLAMP
BUFFER
Q10
LPF 1
SUB CLAMP DET
SUB CLAMP
DEEMP
DETAIL ENHANCER
DYNAMIC HPF
LIMITER
Q16
ES
D13
TNR/AUX
SPCL PB
Q14
D12
D11
COMP SYNC
D18
V. PULSE
Q15
SWD 5V
EE
D7
SPCL PB
D6
Q11
R29
V PULSE
EQ 1
D3
C17,C18,L10
TRAP
R22,R23
Q8,D4,R20,R21
PB: DC level of sharpness is controlled
REC: OPEN
D4
SHARPNESS
R22
R40
D14
EDIT
R43
D15
D10
SP
D17
YNR PLUSE
YNR CTL
L: THROUTH, H: YNR
PULSE DELAY
DOC
LPF
LPF
FREQ DEMOD
LIMITER
MIX
LIMITER
HPF
DOUBLE LIMITER CIRCUIT
D9
REC/INSERT
W/D CLIP
NLN EMP &DEEMP
NLN MIX
MAIN EMP
CARR & DEV
FREQ MOD
NR
NR SW
ON
OFF
YNR
YNR CIRCUIT
SYNC SEP
CLAMP
FM CAR INT CTL
SYNC
COLOR ROT
Q7
R18,L9,C15
D16
DETAIL ENHANCER OFF SW
L2
L1
C1
R1
C2
Q6
R17,C14
NOISE CANCEL OFF SW
D19
IH DL
IC2
3fsc
Q13
BUFFER
LPF 2
R31
Q12
BUFFER
C4
R31
YNR NC BAL
C9,L4,L6
HPF
Q2
BUFFER
Q1
R3
D1
Q4
BUFFER
R10
Q5
R15
D2
Q3
PICTURE MUTE
CN1
JP201
CN2
JP202
IC201
MM
REC CTL
FADER CTL
BUFFER
COMP SYNC
REC START
D205
D203
R203
R204
D202
D204
FADER
SWD 5V
D201
R201
R202
CN204
VIDEO
To 36 JACK,CN251
CN201
PB FM
Q201
BUFFER
Q202
D206
PICTURE MUTE
Q205
REC FM⊕ COLOR MIX
REC FM COLOR
TP205
REC COL
From/To 43 PRE/REC CN202
D207
SP/EP SW
Q203
Q204
R210
SP REC COL
R228
EP REC COL
TP252
VIDEO OUT
VIDEO OUT
VIDEO OUT
To RF CONV
CN901
EF
Q903
IC901
17 ON SCREEN
From 43 PRE/REC,CN202
LPF 201
PB COLOR
BUFFER
Q206
TP206
PB FM
To 03 SERVO(MAIN)
C203
AUTO BALANCE FILTER
C206
AUTO BALANCE FILTER
4.2MHz TANK
T201
R201,C207,C208
REC APC FILTER
C209
C210
Q201
CF201
BPF
R204
D201
X201
X'tal
X3
X'TAL OSC
Vcc
GND
REC LPF
EMPHASIS KILLER
AUTO BALANCE
SUB CONV
MAIN CONV
ACC
ACC DET
PB (SP)
APC SW
PB(EP/LP)
CR
REC APC P.D
PB APC P.D
KILLER P.D
320Fh VCO
REC AFC P.D
CORRELATED DET
DE-EMPH
1H DL C.F DRIVE
DISCR
PB KILLER
ID DET
SP/LP/EP
PB/REC
COLOR ROT
R216
CNR PULSE
D208
BPF 201
ACC DET
C219
1H DL
DL201
C233
Q202
D202
D207
Q203
Q204
D204
R216,C228,C229
REC AFC/PB APC DET FILTER
R217,C227
COLOR DET FILTER
D205,D206,R219,C230
SHORTLY EE To PB MUTE
D207

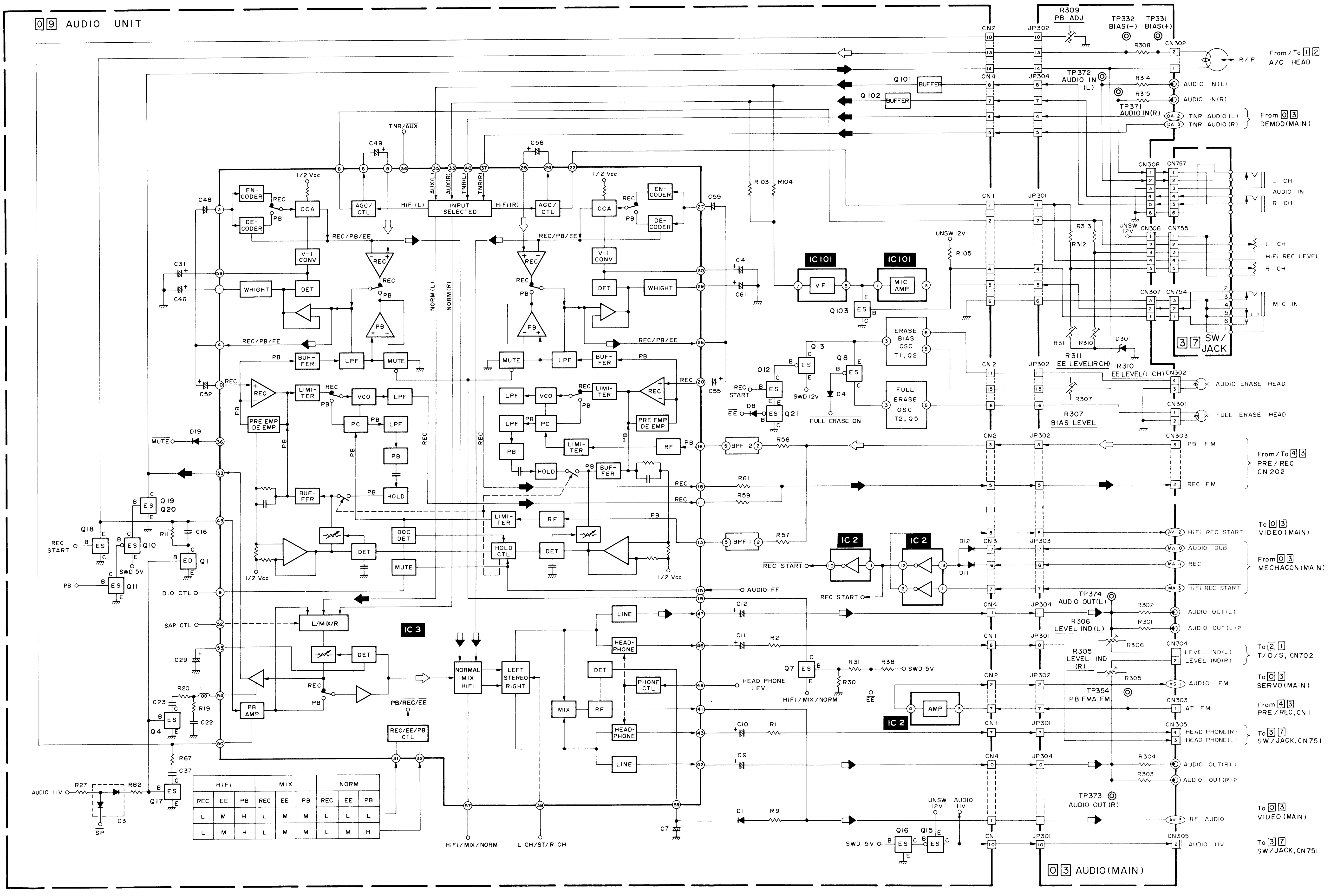
3.10 PRE/REC BLOCK DIAGRAM


6
5
4
3
2
1
A
B
C
D
E
F
G
H
4 3 PRE/REC
ROTARY TRANS
4 1 UPPER DRUM
IC201
R231
D203
REC START
D202
MUTE SW ON/OFF
REC DET
SW18
SP
EP
SWD 5V
R225
R224
ES
Q205
R223
SWD 5V
R215
D201
SP
ES
Q206
SWD 5V
R218
AUTO/MAN/SLOW
TO EACH SW
INTEGRATED INJECTION LOGIC CTL LOGIC
DRUM FF
SYNC
SP/EP
D. FF/COMP
DRUM FF
COLOR ROT
SP/EP
ENV DET
ENV CONP
(AUTO) SW17
OFF
R219
C214
From/To 0 3 VIDEO CN201
CN202
PB COLOR
GND
SP
EP
SW16
C203 L202
HPF
Q201,R206 L204,C207
EQ AMP 1
Q202,R210,C209 C210,L205,L206
EQ AMP 2
L207
C211
Q203
BUFFER
ENV DET
C213
AGC DET FILTER
AGC DET
SWD 5V
R215
R213
D201
SWD 5V
ES
Q204
R212
REC/PB
PB FM
REC FM COLOR
REC
SW14
SW15
SW13
SWD 5V
R216
R230
C212
PRE AMP
CH2
SW11
SW1
EP PB
EP REC :ON
SW2
EP PB
EP REC :ON
PRE AMP
CH1
SW3
EP PB
EP REC :ON
SW6
SP PB
SP REC :ON
PRE AMP
CH1
SW5
SP PB
SP REC :ON
SW9
PB:ON
SW10
PB:ON
SW4
SP PB
SP REC :ON
SW12
EP
PRE AMP
CH2
Vcc
SP CH2 Q ADJ
R229 C232
REC DET FILTER
C230 C231
SP CH1 Q ADJ
R228,C227
EP CH1 Q ADJ
R227,C226
C219
EP CH2 Q ADJ
R226 C218
SWD 5V
CN203
CH2
SP REC/PB HEADS
CH1
CH1
EP REC/PB HEADS
CH2
FMA CH2
FMA CH1
C5
Q2
ES
PB 5V
C3
Q1
ES
PB 5V
SWD 5V
R12
R4
ES
Q5
HiFi REC START
HiFi REC START
D2
R9
SWD 5V
IC1
From/To 0 3 AUDIO CN303
CN1
REC FM IN
PB FM OUT
AT FM OUT
SW5
AMP
EQ
MODE CTL
BUFFER
Q4
AGC AMP
DET
TK AMP
AUDIO FF
CH1
SW2 PB:ON
DET
SW1 PB:ON
SW3 PB:ON
CH2
SP
PB GAIN CTL
D1,R10
R2 C2
DAMP ADJ
C7
C1
REC AGC LEVEL
R1
REC AGC LEVEL
C12
Q3 C12 C13
DAMP ADJ
C8 R3

3.11 SERVO BLOCK DIAGRAM

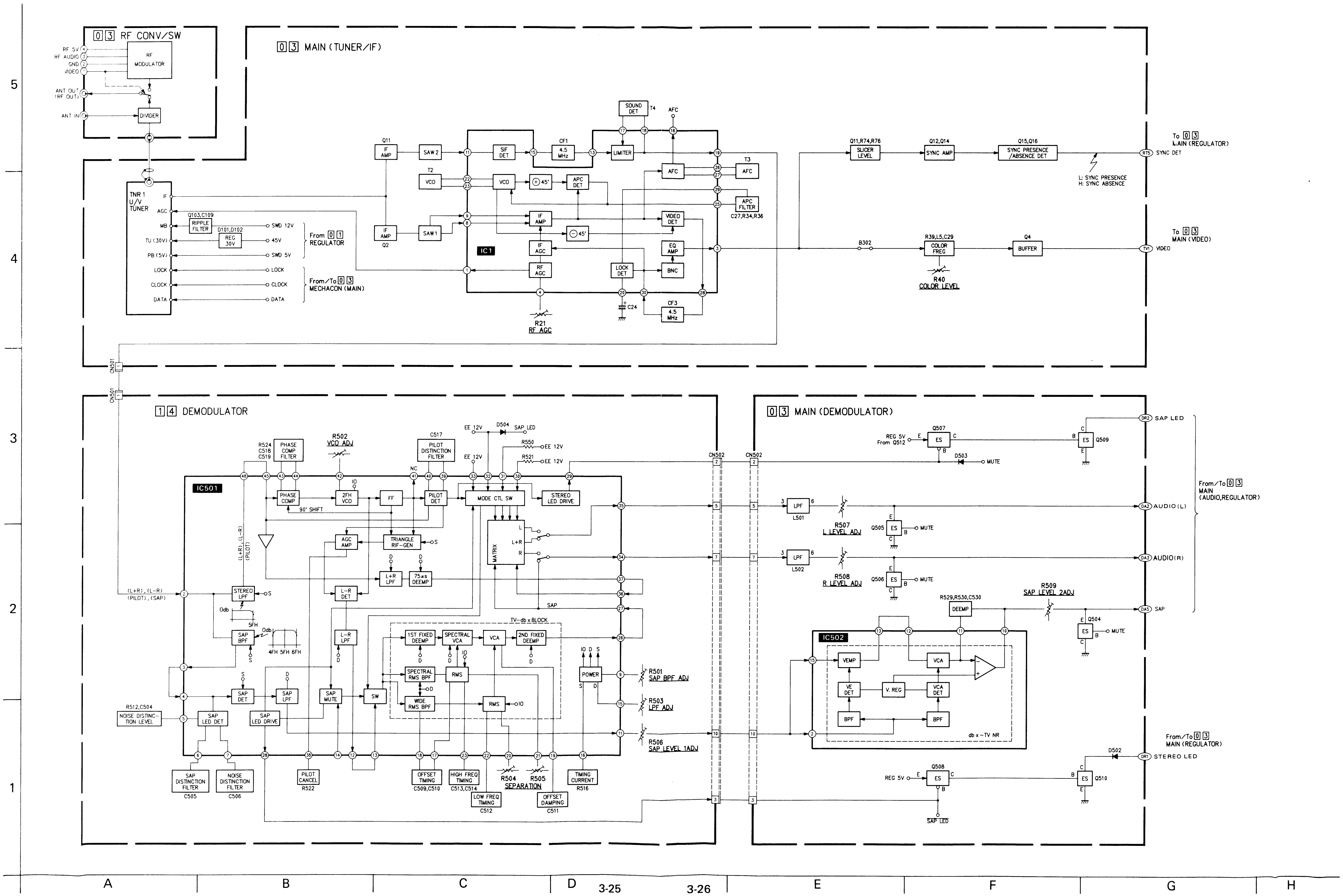

03 SERVO (MAIN)
SWD 5V
Vcc
DRUM START
LCM 1
LCM 2
TP603
DRUM START
CTL PULSE
CAP FG
SERIAL CLOCK
SERIAL DATA
COMP SYNC
SPCL PB
V PULSE
YNR PULSE
DRUM FF
AUDIO FF
3FSC
DUTY I/O (INDEX)
CTL CLOCK
D403
D402
From/To 03 VIDEO/MECHACON AUDIO/REGULATOR
TP411 DRUM FF
COUNT DOWN
SERIAL DECODER
NTSC MODE
FUNCTION MODE
SYNC SEP
REF 30HZ
REC/PB CTL GEN.INDEX DET
"0" "1" "0"
DRUM FF Z V PULSE GEN.
DRUM F-V CONV
DRUM PHASE DET
DRUM REF
CAP REF
CAP PHASE DET
CAP F-V CONV
IC401
C423
R427
PB SW POINT
DRUM PG/FG
R425,C422
LPF
DRUM SEL B
R424,R426 C420,C421
ACTIVE FILTER
DIF AMP
DRUM GAIN
R422 R423
SW 11
SW 9
SPCL PB:ON
SW 10
SPCL PB:ON
Vcc/2
CAP PD FIX:ON
R420
D408
D407
NONLINEAR & PHASE LOOP FILTER
R416 R421
C418 C419
M:LOOP ON, L:CAP/DRUM PD FIX
R414
R415,C416,C417
PHASE LOOP FILTER
V. FM
SW 7
SW 6
SW 5
CAP GAIN SW
R411 R412 R413
R407
R409 R410
C414 C415
GND
D406
D411
CN402
DRUM PG/FG
DRUM DRIVE
From/To DRUM MDA CN1
LCM 1
LCM 2
V PULSE
From/To 03 MECHACON
DRUM DRIVE
From/To 03 MECHACON
CN452
CN451
VIDEO FM
AUDIO FM
SP
DRUM FF
HPF
C453
DIGITAL TRACKING DET
S/H
C454
IC451
83 A. T
CN451 CN452
AVG FM
From 03 MECHACON
D412
D404
D405
PAUSE
SERVO
CAP CTL V
From/To 03 MECHACON
R405,C408
LPF
R404,C407
TP401 CTL PULSE
SWD 5V
REC START
ES
C427
Q402
Q401 R402 R403
DRUM START
CTL GAIN & FILTER
C403 C404
C402
SW 4
AMP
SW 1 REC: ON
SW 3 PB
SW 2 REC
RECORDING TAPE
CTL HEAD
12 A/CTL HEAD
CN2
CN401
5
4
3
2
1
A
B
C
D
E
F
G
H

3.12 AUDIO BLOCK DIAGRAM


09 AUDIO UNIT
IC 3
IC101
IC 2
INPUT SELECTED
EN-CODER
DE-CODER
CCA
AGC/CTL
V-I CONV
WHIGHT
DET
REC
PB
BUF-FER
LPF
MUTE
LIMI-TER
VCO
PC
PRE EMP DE EMP
HOLD
RF
HOLD CTL
DOC DET
L/MIX/R
PB AMP
REC/EE/PB CTL
NORMAL MIX HiFi
LEFT STEREO RIGHT
LINE
HEAD-PHONE
PHONE CTL
MIX
VF
MIC AMP
ERASE BIAS OSC T1, Q2
FULL ERASE OSC T2, Q5
AMP
BUFFER
Q101
Q102
Q103
BPF 1
BPF 2
TNR/AUX
HiFi(L)
HiFi(R)
REC/PB/EE
NORM(L)
NORM(R)
MUTE
D.O CTL
SAP CTL
REC START
AUDIO FF
HEAD PHONE LEV
HiFi/MIX/NORM
L CH/ST/R CH
PB/REC/EE
AUDIO 11V
SWD 5V
SWD 12V
UNSW 12V
FULL ERASE ON
CN2
CN1
CN3
CN4
JP301
JP302
JP303
JP304
R309 PB ADJ
TP332 BIAS(−)
TP331 BIAS(+)
CN302
R/P
From/To 12 A/C HEAD
TP372 AUDIO IN (L)
TP371 AUDIO IN(R)
AUDIO IN(L)
AUDIO IN(R)
TNR AUDIO(L)
TNR AUDIO(R)
From 03 DEMOD(MAIN)
CN308
CN757
L CH
AUDIO IN
R CH
CN306
CN755
HiFi REC LEVEL
CN307
CN754
MIC IN
37 SW/JACK
R311 EE LEVEL(R CH)
R310 EE LEVEL(L CH)
AUDIO ERASE HEAD
FULL ERASE HEAD
R307 BIAS LEVEL
CN303
PB FM
REC FM
From/To 43 PRE/REC CN202
HiFi REC START
AUDIO DUB
REC
To 03 VIDEO(MAIN)
From 03 MECHACON(MAIN)
TP374 AUDIO OUT(L)
AUDIO OUT(L)1
AUDIO OUT(L)2
R306 LEVEL IND(L)
R305 LEVEL IND (R)
CN304
LEVEL IND(L)
LEVEL IND(R)
To 21 T/D/S, CN702
AUDIO FM
To 03 SERVO(MAIN)
TP354 PB FMA FM
AT FM
From 43 PRE/REC, CN1
CN305
HEAD PHONE(R)
HEAD PHONE(L)
To 37 SW/JACK, CN751
AUDIO OUT(R)1
AUDIO OUT(R)2
TP373 AUDIO OUT(R)
RF AUDIO
AUDIO 11V
03 AUDIO(MAIN)
A
B
C
D
E
F
G
H
1
2
3
4
5
6

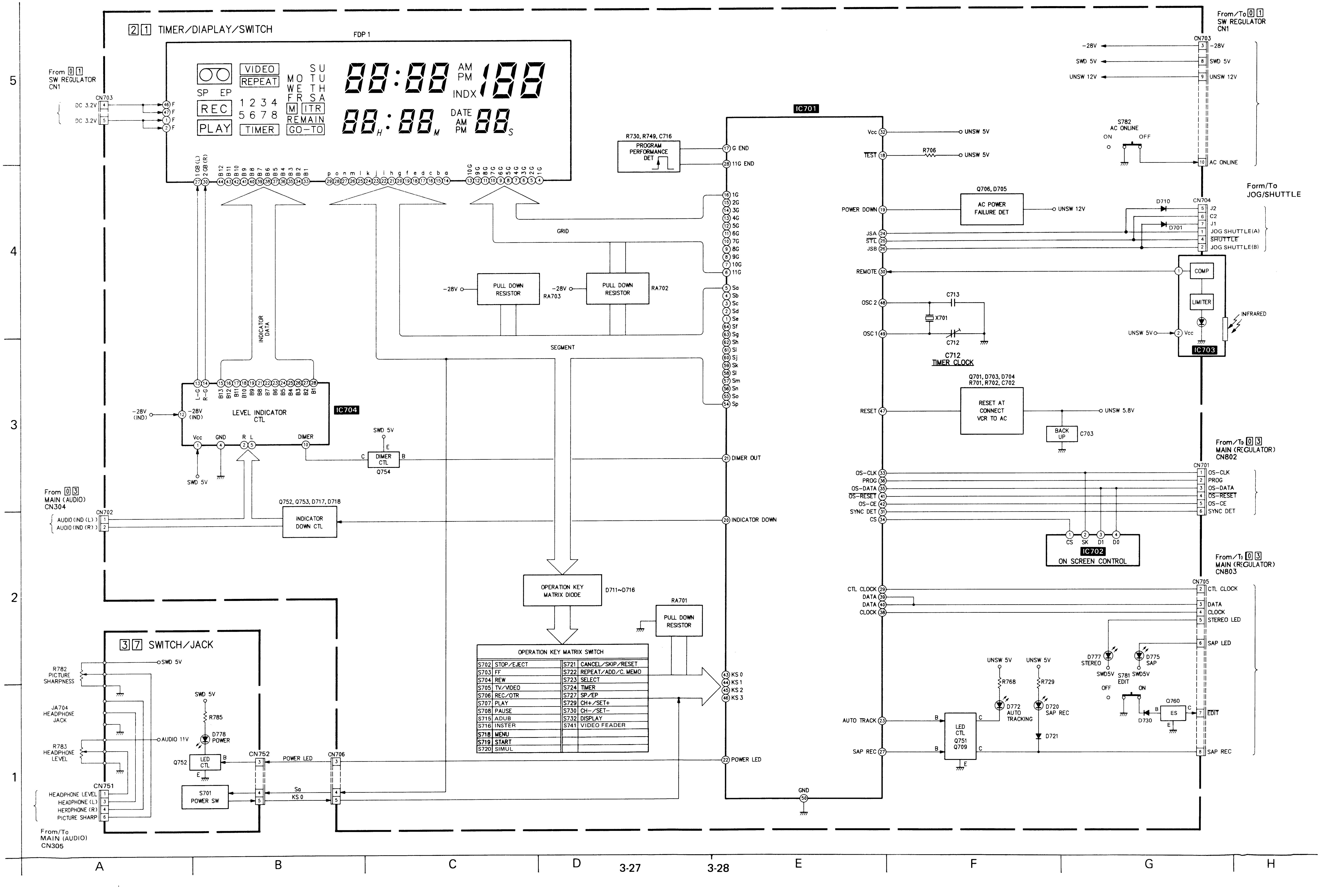
HiFi			MIX			NORM		
REC	EE	PB	REC	EE	PB	REC	EE	PB
L	M	H	L	M	M	L	L	L
L	M	H	L	M	M	L	M	H

3.13 TUNER IF AND DEMODULATOR BLOCK DIAGRAMS



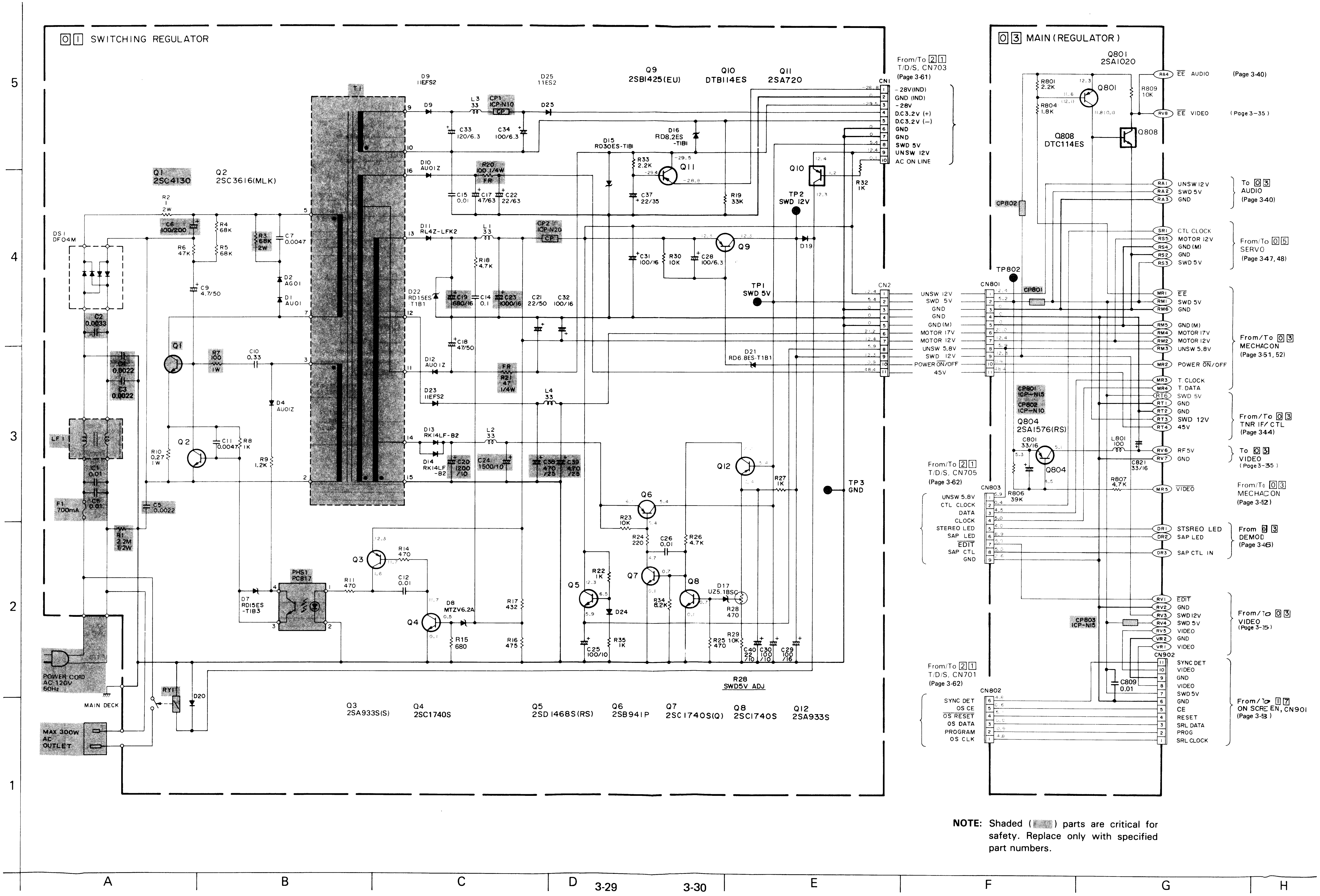
03 RF CONV/SW
RF 5V
RF AUDIO
GND
VIDEO
RF MODULATOR
ANT OUT (RF OUT)
ANT IN
DIVIDER
03 MAIN (TUNER/IF)
TNR 1 U/V TUNER
IF
AGC
MB
TU (30V)
PB (5V)
LOCK
CLOCK
DATA
Q103,C109
RIPPLE FILTER
D101,D102
REG 30V
SWD 12V
45V
SWD 5V
From 01 REGULATOR
LOCK
CLOCK
DATA
From/To 03 MECHACON (MAIN)
Q11
IF AMP
IF AMP
Q2
SAW 2
T2
VCO
SAW 1
SIF DET
VCO
CF1
4.5 MHz
SOUND DET
T4
AFC
LIMITER
+45°
APC DET
IF AMP
−45°
IF AGC
RF AGC
IC1
LOCK DET
AFC
VIDEO DET
EQ AMP
BNC
T3
AFC
APC FILTER
C27,R34,R36
C24
CF3
4.5 MHz
R21
RF AGC
Q11,R74,R76
SLICER LEVEL
Q12,Q14
SYNC AMP
Q15,Q16
SYNC PRESENCE /ABSENCE DET
L: SYNC PRESENCE
H: SYNC ABSENCE
RT5
SYNC DET
To 03 MAIN (REGULATOR)
B302
R39,L5,C29
COLOR FREQ
Q4
BUFFER
R40
COLOR LEVEL
TV1
VIDEO
To 03 MAIN (VIDEO)
CN501
CN501
14 DEMODULATOR
IC501
R524 C518 C519
PHASE COMP FILTER
R502
VCO ADJ
C517
PILOT DISTINCTION FILTER
EE 12V
D504
SAP LED
R550
EE 12V
R521
EE 12V
NC
IO
PHASE COMP
90° SHIFT
2FH VCO
FF
PILOT DET
MODE CTL SW
STEREO LED DRIVE
(L+R), (L−R) (PILOT)
AGC AMP
TRIANGLE RIF-GEN
S
MATRIX
L
L+R
R
L+R LPF
75μs DEEMP
D
D
(L+R), (L−R) (PILOT), (SAP)
STEREO LPF
S
L−R DET
SAP
0db
5FH
0db
SAP BPF
4FH 5FH 6FH
L−R LPF
TV-db x BLOCK
1ST FIXED DEEMP
SPECTRAL VCA
VCA
2ND FIXED DEEMP
SPECTRAL RMS BPF
RMS
WIDE RMS BPF
RMS
IO D S
POWER
S D
SAP DET
SAP LPF
SAP MUTE
SW
R512,C504
NOISE DISTINCTION LEVEL
SAP LED DET
SAP LED DRIVE
R501
SAP BPF ADJ
R503
LPF ADJ
R506
SAP LEVEL 1ADJ
SAP DISTINCTION FILTER
C505
NOISE DISTINCTION FILTER
C506
PILOT CANCEL
R522
OFFSET TIMING
C509,C510
HIGH FREQ TIMING
C513,C514
LOW FREQ TIMING
C512
R504
R505
SEPARATION
OFFSET DAMPING
C511
TIMING CURRENT
R516
CN502
CN502
03 MAIN (DEMODULATOR)
REG 5V From Q512
Q507
ES
D503
MUTE
Q509
ES
DR2
SAP LED
LPF
L501
R507
L LEVEL ADJ
Q505
ES
MUTE
DA2
AUDIO (L)
LPF
L502
R508
R LEVEL ADJ
Q506
ES
MUTE
DA3
AUDIO (R)
From/To 03 MAIN (AUDIO,REGULATOR)
R529,R530,C530
DEEMP
R509
SAP LEVEL 2ADJ
DA5
SAP
Q504
ES
MUTE
IC502
VEMP
VCA
VE DET
V. REG
VCA DET
BPF
BPF
db x−TV NR
D502
DR1
STEREO LED
From/To 03 MAIN (REGULATOR)
REG 5V
Q508
ES
Q510
ES
SAP LED
5
4
3
2
1
A
B
C
D
E
F
G
H

3.14 TIMER/DISPLAY/SWITCH AND SWITCH/JACK BLOCK DIAGRAMS



5
4
3
2
1
A
B
C
D
E
F
G
H
2 1 TIMER/DIAPLAY/SWITCH
FDP 1
From 0 1 SW REGULATOR CN1
CN703
DC 3.2V
DC 3.2V
VIDEO
REPEAT
SP EP
REC
PLAY
1 2 3 4
5 6 7 8
MO TU WE TH FR SA SU
M ITR
REMAIN
TIMER
GO-TO
AM PM
INDX
DATE
AM PM
1G
2G
3G
4G
5G
6G
7G
8G
9G
10G
11G
GRID
SEGMENT
INDICATOR DATA
PULL DOWN RESISTOR
RA703
-28V
PULL DOWN RESISTOR
RA702
R730, R749, C716
PROGRAM PERFORMANCE DET
IC701
G END
11G END
Sa
Sb
Sc
Sd
Se
Sf
Sg
Sh
Si
Sj
Sk
Sl
Sm
Sn
So
Sp
IC704
LEVEL INDICATOR CTL
-28V (IND)
L-G
R-G
Vcc
GND
R L
DIMER
SWD 5V
DIMER CTL
Q754
DIMER OUT
From 0 3 MAIN (AUDIO) CN304
CN702
AUDIO (IND (L))
AUDIO (IND (R))
Q752, Q753, D717, D718
INDICATOR DOWN CTL
INDICATOR DOWN
OPERATION KEY MATRIX DIODE
D711~D716
RA701
PULL DOWN RESISTOR
OPERATION KEY MATRIX SWITCH
S702 STOP/EJECT
S703 FF
S704 REW
S705 TV/VIDEO
S706 REC/OTR
S707 PLAY
S708 PAUSE
S715 ADUB
S716 INSTER
S718 MENU
S719 START
S720 SIMUL
S721 CANCEL/SKIP/RESET
S722 REPEAT/ADD/C. MEMO
S723 SELECT
S724 TIMER
S727 SP/EP
S729 CH+/SET+
S730 CH-/SET-
S732 DISPLAY
S741 VIDEO FEADER
KS 0
KS 1
KS 2
KS 3
POWER LED
GND
3 7 SWITCH/JACK
SWD 5V
R782 PICTURE SHARPNESS
JA704 HEADPHONE JACK
AUDIO 11V
R783 HEADPHONE LEVEL
CN751
HEADPHONE LEVEL
HEADPHONE (L)
HEROPHONE (R)
PICTURE SHARP
From/To MAIN (AUDIO) CN305
R785
D778 POWER
Q752
LED CTL
CN752
POWER LED
CN706
S701 POWER SW
Sa
KS 0
Vcc
UNSW 5V
TEST
R706
POWER DOWN
Q706, D705
AC POWER FAILURE DET
UNSW 12V
JSA
STL
JSB
REMOTE
OSC 2
OSC 1
C713
X701
C712
C712 TIMER CLOCK
Q701, D703, D704 R701, R702, C702
RESET
RESET AT CONNECT VCR TO AC
UNSW 5.8V
BACK UP
C703
OS-CLK
PROG
OS-DATA
OS-RESET
OS-CE
SYNC DET
CS
CS SK D1 D0
IC702
ON SCREEN CONTROL
CTL CLOCK
DATA
DATA
CLOCK
AUTO TRACK
SAP REC
LED CTL Q751 Q709
UNSW 5V
R768
D772 AUTO TRACKING
UNSW 5V
R729
D720 SAP REC
D721
From/To 0 1 SW REGULATOR CN1
CN703
-28V
SWD 5V
UNSW 12V
S782 AC ONLINE
ON OFF
AC ONLINE
Form/To JOG/SHUTTLE
CN704
D710
D701
J2
C2
J1
JOG SHUTTLE(A)
SHUTTLE
JOG SHUTTLE(B)
COMP
LIMITER
INFRARED
Vcc
IC703
From/To 0 3 MAIN (REGULATOR) CN802
CN701
OS-CLK
PROG
OS-DATA
OS-RESET
OS-CE
SYNC DET
From/To 0 3 MAIN (REGULATOR) CN803
CN705
CTL CLOCK
DATA
CLOCK
STEREO LED
SAP LED
D777 STEREO
D775 SAP
SWD5V
S781 EDIT
OFF ON
Q760
ES
D730
EDIT
SAP REC

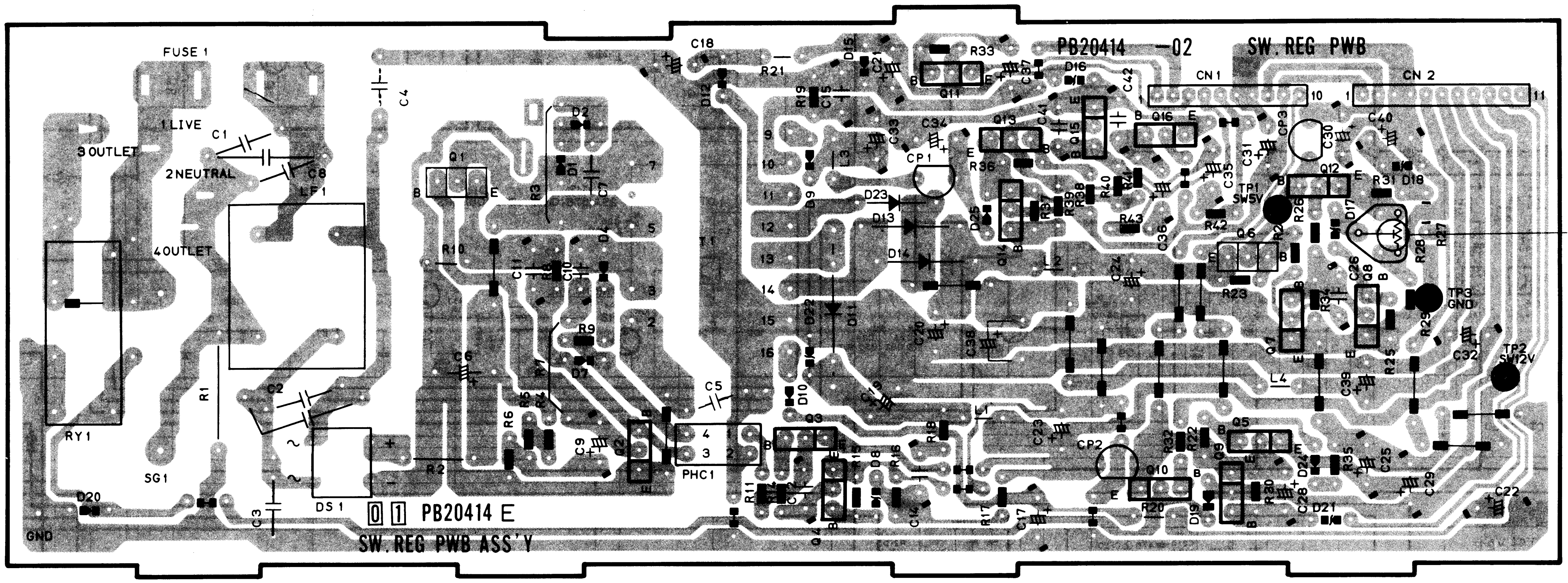
3.15 SWITCHING REGULATOR SCHEMATIC DIAGRAM



01 SWITCHING REGULATOR
03 MAIN (REGULATOR)
T1
Q1 2SC4130
Q2 2SC3616(MLK)
Q9 2SB1425(EU)
Q10 DTB114ES
Q11 2SA720
Q3 2SA933S(S)
Q4 2SC1740S
Q5 2SD1468S(RS)
Q6 2SB941P
Q7 2SC1740S(Q)
Q8 2SC1740S
Q12 2SA933S
Q801 2SA1020
Q808 DTC114ES
Q804 2SA1576(RS)
DS1 DF04M
LF1
F1 700mA
R1 2.2M 1/2W
C1 0.01
C2 0.0033
C3 0.0022
C4 0.0022
C5 0.0022
C6 100/200
R2 1 2W
R3 68K 2W
R4 68K
R5 68K
R6 47K
C7 0.0047
C9 4.7/50
D1 AU01
D2 AG01
R7 100 1W
C10 0.33
R10 0.27 1W
C11 0.0047
R8 1K
R9 1.2K
D4 AU01Z
D7 RD15ES -T1B3
PHS1 PC817
R11 470
C12 0.01
R14 470
D8 MTZV6.2A
R15 680
R16 475
R17 432
D9 11EFS2
D25 11ES2
L3 33
CP1 ICP-N10
C33 120/6.3
C34 100/6.3
D10 AU01Z
R20 100 1/4W
C15 0.01
C17 47/63
C22 22/63
D11 RL4Z-LFK2
L1 33
CP2 ICP-N20
R18 4.7K
D22 RD15ES T1B1
C19 680/16
C14 0.1
C23 1000/16
C21 22/50
C32 100/16
C18 47/50
D12 AU01Z
R21 47 1/4W
D23 11EFS2
L4 33
D13 RK14LF-B2
D14 RK14LF -B2
L2 33
C20 1200 /10
C24 1500/10
C38 470 /25
C39 470 /25
D15 RD30ES-T1B1
D16 RD8.2ES -T1B1
R33 2.2K
C37 22/35
R19 33K
R32 1K
C31 100/16
R30 10K
C28 100/6.3
D19
TP2 SWD 12V
TP1 SWD 5V
TP3 GND
D21 RD6.8ES-T1B1
R27 1K
R23 10K
R24 220
C26 0.01
R26 4.7K
R22 1K
D24
D17 UZ5.1BSC
R34 8.2K
R28 470
R29 10K
R25 470
C25 100/10
R35 1K
C40 22 /10
C30 100 /10
C29 100 /16
R28 SWD5V ADJ
RY1
D20
POWER CORD AC 120V 60Hz
MAIN DECK
MAX 300W AC OUTLET
CN1
From/To 21 T/D/S, CN703 (Page 3-61)
-28V(IND)
GND (IND)
-28V
DC3.2V (+)
DC3.2V (−)
GND
GND
SWD 5V
UNSW 12V
AC ON LINE
CN2
UNSW 12V
SWD 5V
GND
GND
GND (M)
MOTOR 17V
MOTOR 12V
UNSW 5.8V
SWD 12V
POWER ON/OFF
45V
CN801
TP802
CP801
CP802
CP801 ICP-N15
CP802 ICP-N10
CP803 ICP-N15
R801 2.2K
R804 1.8K
R809 10K
C801 33/16
R806 39K
L801 100
C821 33/16
R807 4.7K
C809 0.01
EE AUDIO (Page 3-40)
EE VIDEO (Page 3-35)
UNSW 12V
SWD 5V
GND
To 03 AUDIO (Page 3-40)
CTL CLOCK
MOTOR 12V
GND (M)
GND
SWD 5V
From/To 05 SERVO (Page 3-47, 48)
EE
SWD 5V
GND
GND (M)
MOTOR 17V
MOTOR 12V
UNSW 5.8V
POWER ON/OFF
From/To 03 MECHACON (Page 3-51, 52)
T.CLOCK
T.DATA
SWD 5V
GND
GND
SWD 12V
45V
From/To 03 TNR IF/CTL (Page 3-44)
RF 5V
GND
To 03 VIDEO (Page 3-35)
VIDEO
From/To 03 MECHACON (Page 3-52)
From/To 21 T/D/S, CN705 (Page 3-62)
CN803
UNSW 5.8V
CTL CLOCK
DATA
CLOCK
STEREO LED
SAP LED
EDIT
SAP CTL
GND
STSREO LED
SAP LED
SAP CTL IN
From 03 DEMOD (Page 3-46)
EDIT
GND
SWD 12V
SWD 5V
VIDEO
GND
VIDEO
From/To 03 VIDEO (Page 3-35)
CN902
SYNC DET
VIDEO
GND
VIDEO
SWD 5V
GND
CE
RESET
SRL DATA
PROG
SRL CLOCK
From/To 17 ON SCREEN, CN901 (Page 3-63)
From/To 21 T/D/S, CN701 (Page 3-62)
CN802
SYNC DET
OS CE
OS RESET
OS DATA
PROGRAM
OS CLK
1
2
3
4
5
A
B
C
D
E
F
G
H

NOTE: Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

3.16 SWITCHING REGULATOR CIRCUIT BOARD

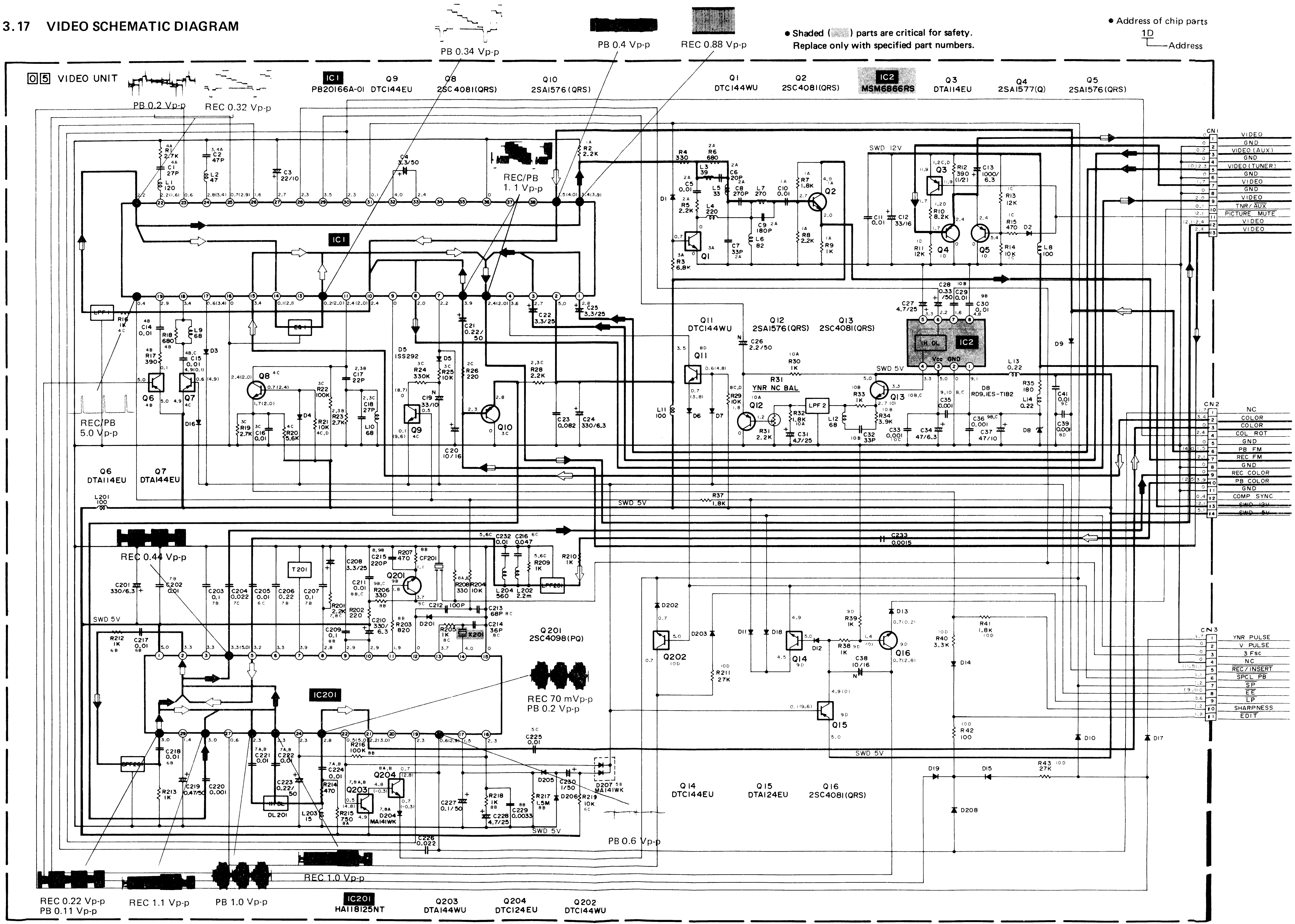

PB20414 -02
SW. REG PWB
PB20414 E
SW. REG PWB ASS'Y
FUSE 1
1 LIVE
2 NEUTRAL
3 OUTLET
4 OUTLET
C1
C8
LF1
RY1
R1
SG1
C2
C3
DS1
D20
GND
C4
Q1
D2
D1
C7
R3
R10
C11
C10
D4
R9
D7
C6
R7
R4
R5
R6
C9
Q2
R2
PHC1
C5
T1
C18
R21
D12
R19
C15
D15
C21
R33
Q11
C37
D16
C42
C34
C33
CP1
R36
Q13
C41
Q15
Q16
CN 1
CN 2
C31
CP3
C30
C40
Q12
R31
D18
TP1 SW5V
R26
D17
R28
R27
D23
D13
D14
D22
D11
D10
Q3
Q4
R11
C12
C14
R16
R18
R17
C17
C19
C20
C36
C23
CP2
Q10
R20
D19
R32
R22
Q5
Q9
R30
C28
D21
D24
R35
C25
C29
C22
C32
TP2 SW12V
TP3 GND
R29
R25
C39
L4
Q7
R34
C26
Q8
R23
Q6
R24
C24
L2
R43
R42
C35
R40
R41
R38
R39
R37
Q14
D25
C38
L3
B9
C27

R28
SW 5V ADJ

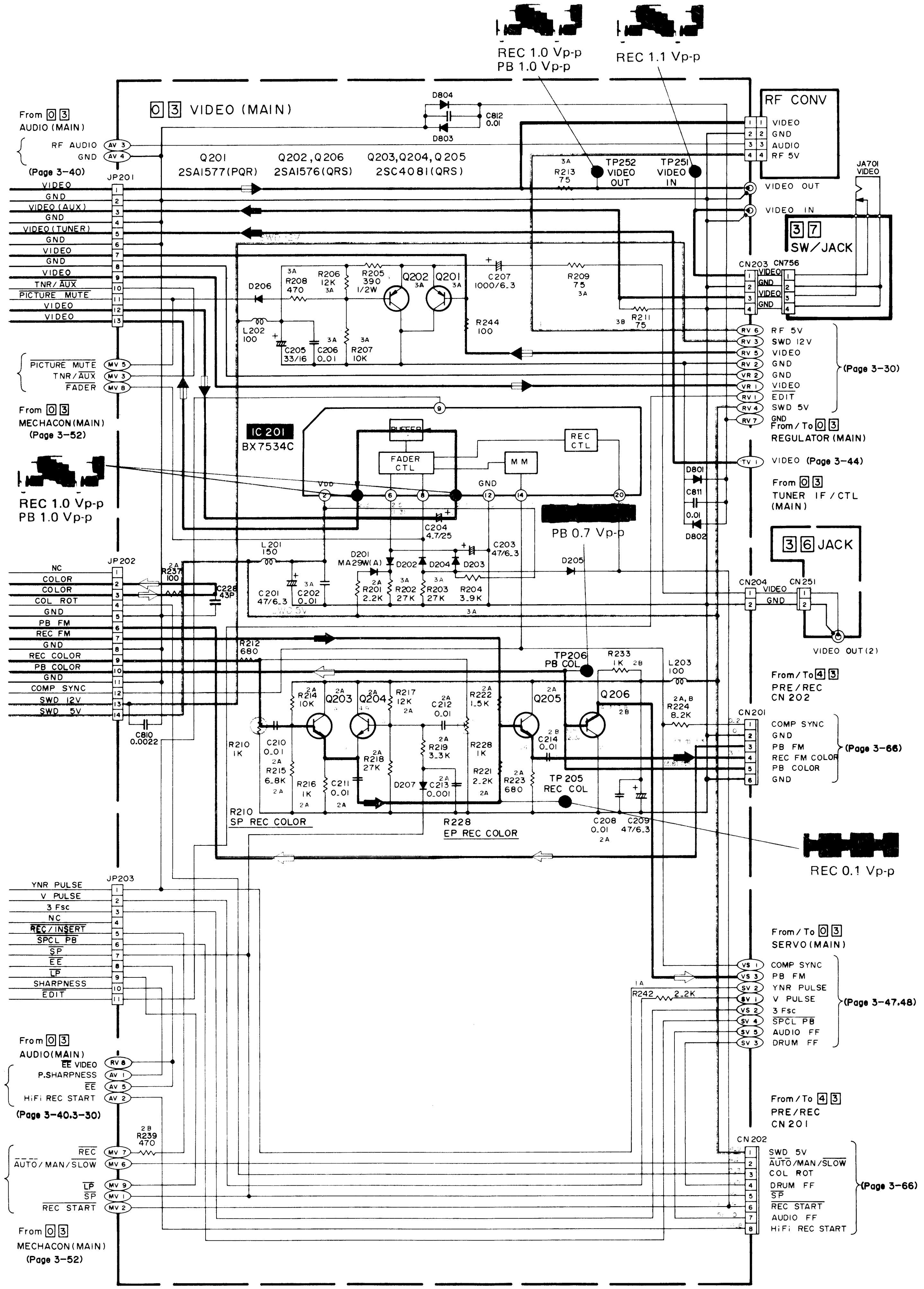
3.17 VIDEO SCHEMATIC DIAGRAM

- Shaded ( ) parts are critical for safety. Replace only with specified part numbers.

- Address of chip parts
1D
└—Address



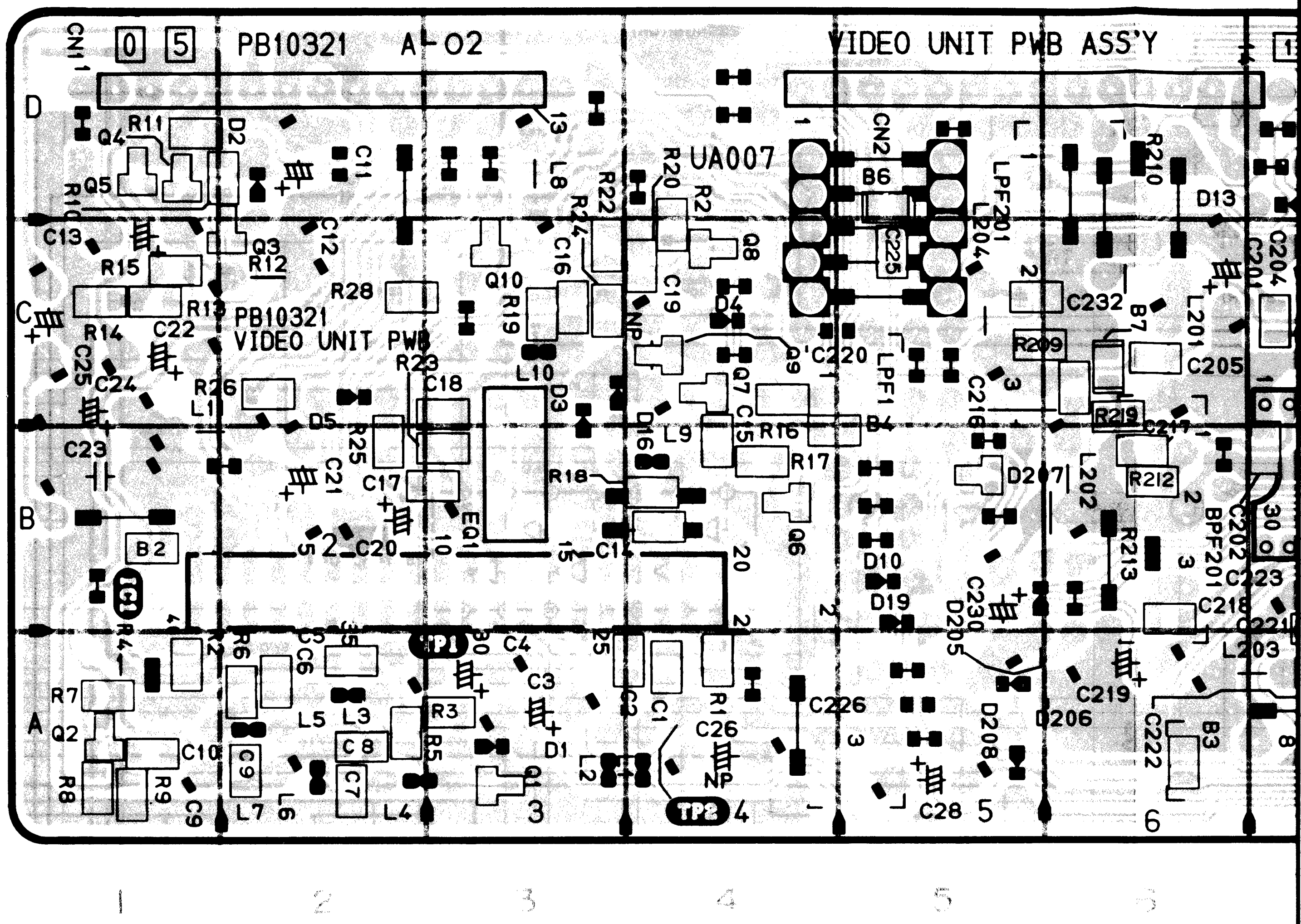
PB 0.34 Vp-p
PB 0.4 Vp-p
REC 0.88 Vp-p
05 VIDEO UNIT
PB 0.2 Vp-p
REC 0.32 Vp-p
IC1 PB20166A-01
Q9 DTC144EU
Q8 2SC4081(QRS)
Q10 2SA1576(QRS)
Q1 DTC144WU
Q2 2SC4081(QRS)
IC2 MSM6866RS
Q3 DTA114EU
Q4 2SA1577(Q)
Q5 2SA1576(QRS)
REC/PB 1.1 Vp-p
REC/PB 5.0 Vp-p
Q6 DTA114EU
Q7 DTA144EU
Q11 DTC144WU
Q12 2SA1576(QRS)
Q13 2SC4081(QRS)
YNR NC BAL
SWD 12V
SWD 5V
LPF 1
LPF 2
LPF 201
BPF 201
DL 201
T201
X201
CF201
IC201
Q201 2SC4098(PQ)
REC 0.44 Vp-p
REC 70 mVp-p
PB 0.2 Vp-p
PB 0.6 Vp-p
REC 1.0 Vp-p
REC 0.22 Vp-p
PB 0.11 Vp-p
REC 1.1 Vp-p
PB 1.0 Vp-p
IC201 HA118125NT
Q203 DTA144WU
Q204 DTC124EU
Q202 DTC144WU
Q14 DTC144EU
Q15 DTA124EU
Q16 2SC4081(QRS)
D5 1SS292
D8 RD9.1ES-T1B2
D204 MA141WK
D207 MA141WK
CN1
VIDEO
GND
VIDEO (AUX)
GND
VIDEO (TUNER)
GND
VIDEO
GND
VIDEO
TNR/AUX
PICTURE MUTE
VIDEO
VIDEO
CN2
NC
COLOR
COLOR
COL ROT
GND
PB FM
REC FM
GND
REC COLOR
PB COLOR
GND
COMP SYNC
SWD 12V
SWD 5V
CN3
YNR PULSE
V PULSE
3 Fsc
NC
REC/INSERT
SPCL PB
SP
EE
LP
SHARPNESS
EDIT
A
B
C
D
E
F
G
H
1
2
3
4
5
6



REC 1.0 Vp-p
PB 1.0 Vp-p
REC 1.1 Vp-p
03 VIDEO (MAIN)
From 03 AUDIO (MAIN)
RF AUDIO
GND
(Page 3-40)
Q201 2SA1577(PQR)
Q202,Q206 2SA1576(QRS)
Q203,Q204,Q205 2SC4081(QRS)
RF CONV
VIDEO
GND
AUDIO
RF 5V
TP252 VIDEO OUT
TP251 VIDEO IN
VIDEO OUT
VIDEO IN
JA701 VIDEO
37 SW/JACK
JP201
VIDEO
GND
VIDEO (AUX)
GND
VIDEO (TUNER)
GND
VIDEO
GND
VIDEO
TNR/AUX
PICTURE MUTE
VIDEO
VIDEO
PICTURE MUTE
TNR/AUX
FADER
From 03 MECHACON(MAIN) (Page 3-52)
CN203
CN756
RF 5V
SWD 12V
VIDEO
GND
GND
VIDEO
EDIT
SWD 5V
GND
(Page 3-30)
From/To 03 REGULATOR (MAIN)
VIDEO (Page 3-44)
From 03 TUNER IF/CTL (MAIN)
IC201 BX7534C
BUFFER
FADER CTL
REC CTL
MM
REC 1.0 Vp-p
PB 1.0 Vp-p
PB 0.7 Vp-p
36 JACK
CN204
CN251
VIDEO OUT(2)
JP202
NC
COLOR
COLOR
COL ROT
GND
PB FM
REC FM
GND
REC COLOR
PB COLOR
GND
COMP SYNC
SWD 12V
SWD 5V
TP206 PB COL
TP205 REC COL
From/To 43 PRE/REC CN202
CN201
COMP SYNC
GND
PB FM
REC FM COLOR
PB COLOR
GND
(Page 3-66)
R210 SP REC COLOR
R228 EP REC COLOR
REC 0.1 Vp-p
JP203
YNR PULSE
V PULSE
3 Fsc
NC
REC/INSERT
SPCL PB
SP
EE
LP
SHARPNESS
EDIT
From/To 03 SERVO (MAIN)
COMP SYNC
PB FM
YNR PULSE
V PULSE
3 Fsc
SPCL PB
AUDIO FF
DRUM FF
(Page 3-47.48)
From 03 AUDIO(MAIN)
EE VIDEO
P.SHARPNESS
EE
HiFi REC START
(Page 3-40.3-30)
REC
AUTO/MAN/SLOW
LP
SP
REC START
From 03 MECHACON(MAIN) (Page 3-52)
From/To 43 PRE/REC CN201
CN202
SWD 5V
AUTO/MAN/SLOW
COL ROT
DRUM FF
SP
REC START
AUDIO FF
HiFi REC START
(Page 3-66)

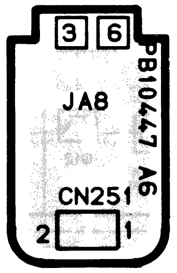
3.18 VIDEO UNIT AND JACK CIRCUIT BOARDS

– VIDEO UNIT –

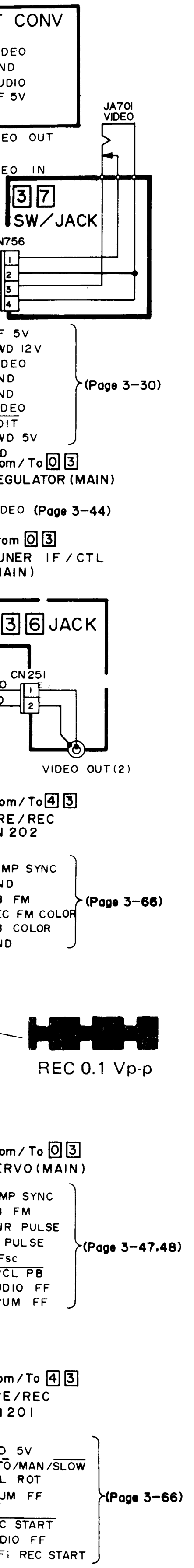


05 PB10321 A-02
VIDEO UNIT PWB ASS'Y
PB10321 VIDEO UNIT PWB
UA007
TP1
TP2
D
C
B
A
1
2
3
4
5
6

– JACK –

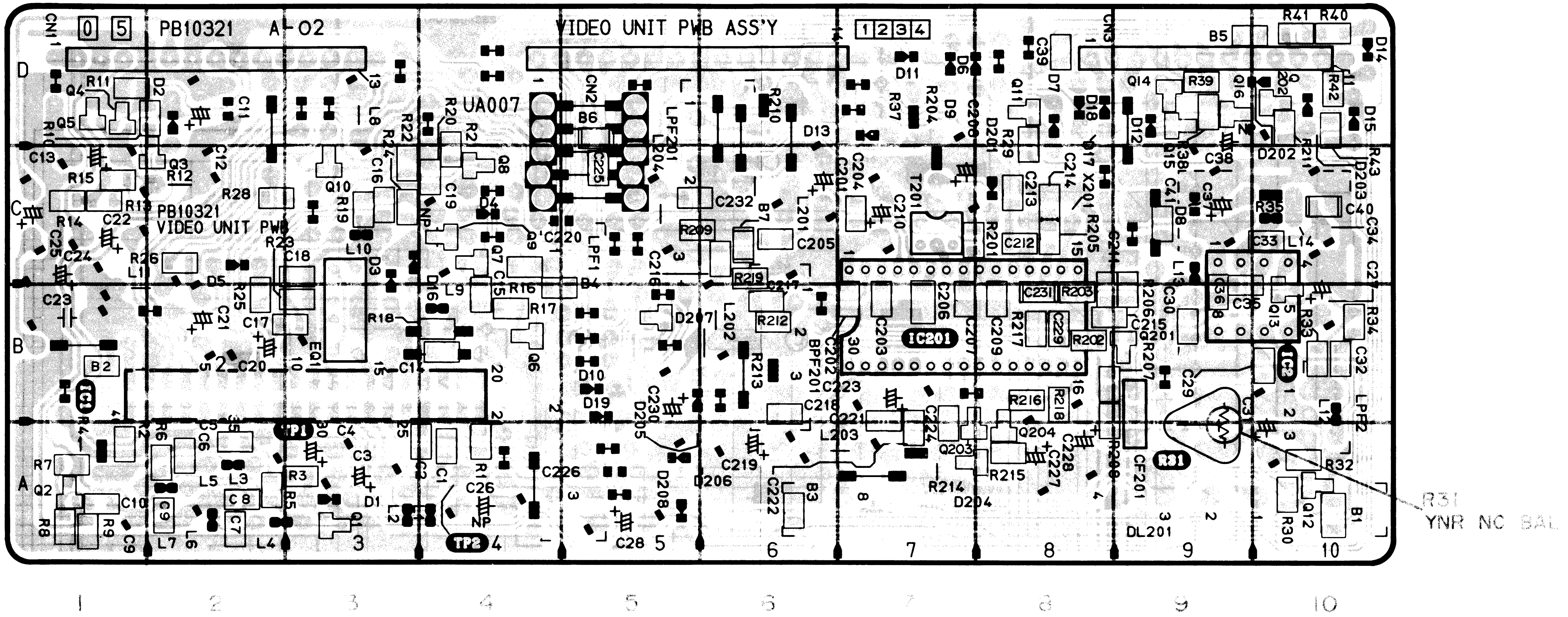


36
PB10447 A6
JA8
CN251
2
1

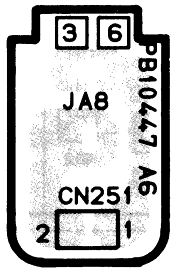

CONV
JA701 VIDEO
SW/JACK
(Page 3-30)
REGULATOR (MAIN)
(Page 3-44)
TUNER IF/CTL
JACK
CN251
VIDEO OUT(2)
(Page 3-66)
REC 0.1 Vp-p
SERVO (MAIN)
(Page 3-47,48)
(Page 3-66)

3.18 VIDEO UNIT AND JACK CIRCUIT BOARDS

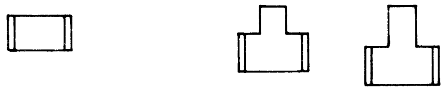
– VIDEO UNIT –


CN1
0 5
PB10321 A-02
VIDEO UNIT PWB ASS'Y
1 2 3 4
CN2
CN3
UA007
IC201
IC1
IC2
TP1
TP2
R31
R31
YNR NC BAL
LPF201
BPF201
DL201
CF201
T201
A
B
C
D
1
2
3
4
5
6
7
8
9
10

– JACK –


3 6
PB10447 A6
JA8
CN251
2
1

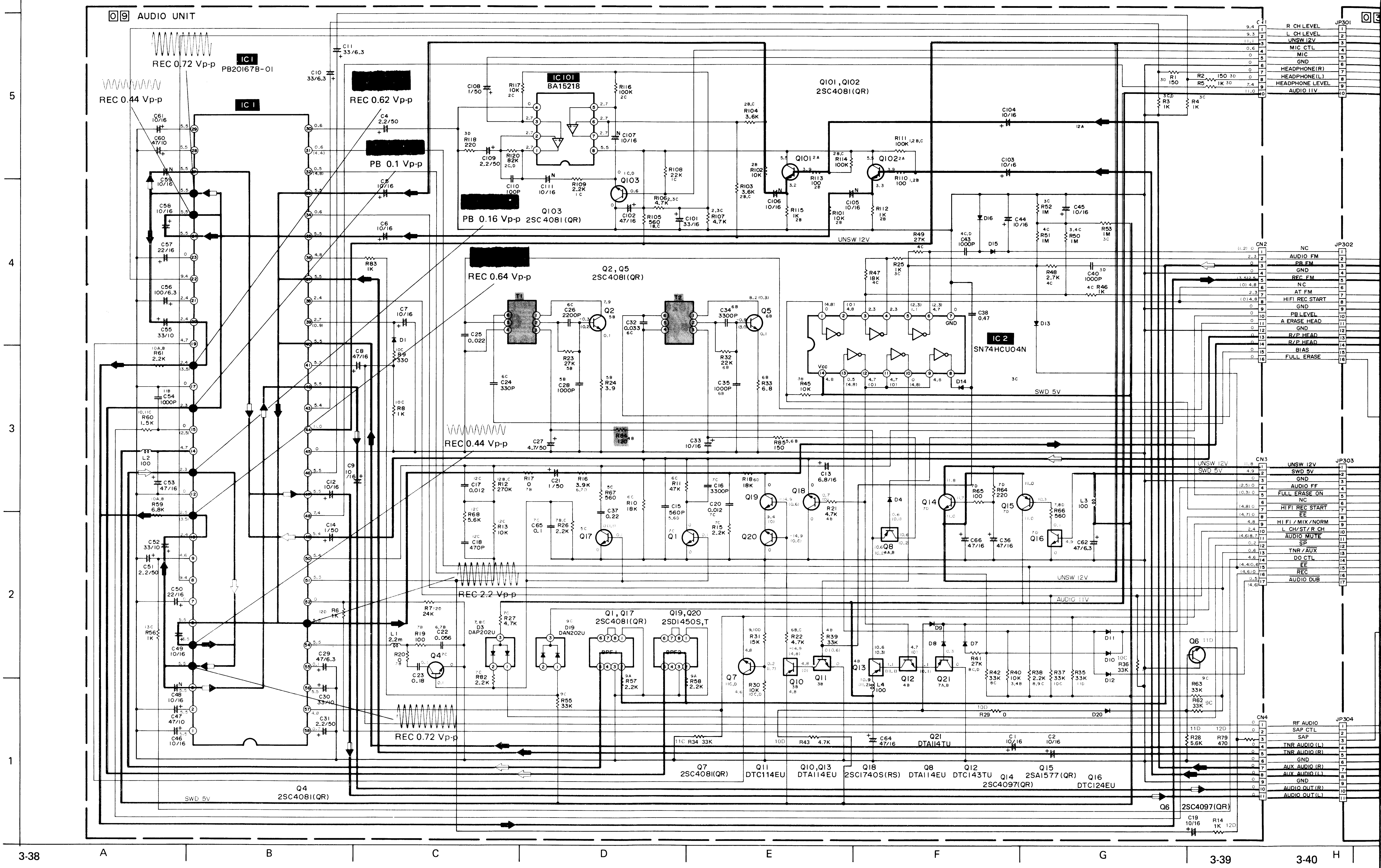
Note: Double edging indicates not used in this model.
Examples; Resistor, Capacitor, Transistor, DIODE



3.19 AUDIO UNIT SCHEMATIC DIAGRAM

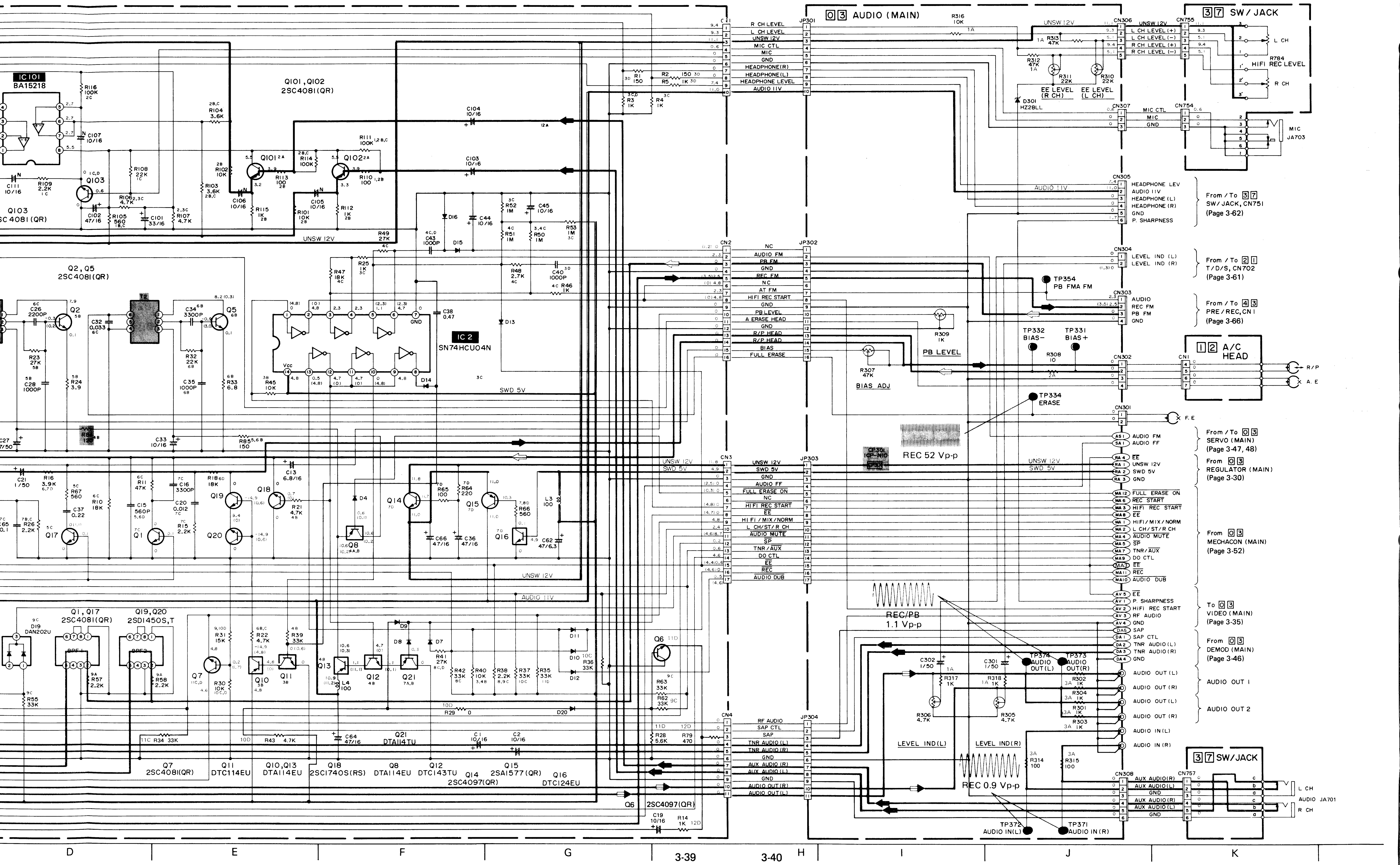
● Address of chip parts
1D
Address

● Shaded ( ) p
Replace only wi


09 AUDIO UNIT
IC1 PB20167B-01
IC1
IC101 BA15218
IC2 SN74HCU04N
Q101, Q102 2SC4081(QR)
Q103 2SC4081(QR)
Q2, Q5 2SC4081(QR)
Q1, Q17 2SC4081(QR)
Q19, Q20 2SD1450S,T
Q4 2SC4081(QR)
Q7 2SC4081(QR)
Q11 DTC114EU
Q10, Q13 DTA114EU
Q18 2SC1740S(RS)
Q8 DTA114EU
Q12 DTC143TU
Q14 2SC4097(QR)
Q15 2SA1577(QR)
Q16 DTC124EU
Q21 DTA114TU
Q6 2SC4097(QR)
D3 DAP202U
D19 DAN202U
BPF1
BPF2
T1
T2
REC 0.72 Vp-p
REC 0.44 Vp-p
REC 0.62 Vp-p
PB 0.1 Vp-p
PB 0.16 Vp-p
REC 0.64 Vp-p
REC 0.44 Vp-p
REC 2.2 Vp-p
REC 0.72 Vp-p
UNSW 12V
SWD 5V
AUDIO 11V
CN1
JP301
R CH LEVEL
L CH LEVEL
UNSW 12V
MIC CTL
MIC
GND
HEADPHONE(R)
HEADPHONE(L)
HEADPHONE LEVEL
AUDIO 11V
CN2
JP302
NC
AUDIO FM
PB FM
GND
REC FM
NC
AT FM
HIFI REC START
GND
PB LEVEL
A ERASE HEAD
GND
R/P HEAD
R/P HEAD
BIAS
FULL ERASE
CN3
JP303
UNSW 12V
SWD 5V
GND
AUDIO FF
FULL ERASE ON
NC
HIFI REC START
EE
HIFI/MIX/NORM
L CH/ST/R CH
AUDIO MUTE
SP
TNR/AUX
DO CTL
EE
REC
AUDIO DUB
CN4
JP304
RF AUDIO
SAP CTL
SAP
TNR AUDIO (L)
TNR AUDIO (R)
GND
AUX AUDIO (R)
AUX AUDIO (L)
GND
AUDIO OUT(R)
AUDIO OUT(L)
1
2
3
4
5
6
A
B
C
D
E
F
G
H

• Address of chip parts
1D
└──Address

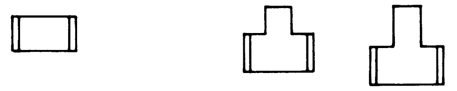
• Shaded (▨) parts are critical for safety.
Replace only with specified part numbers.



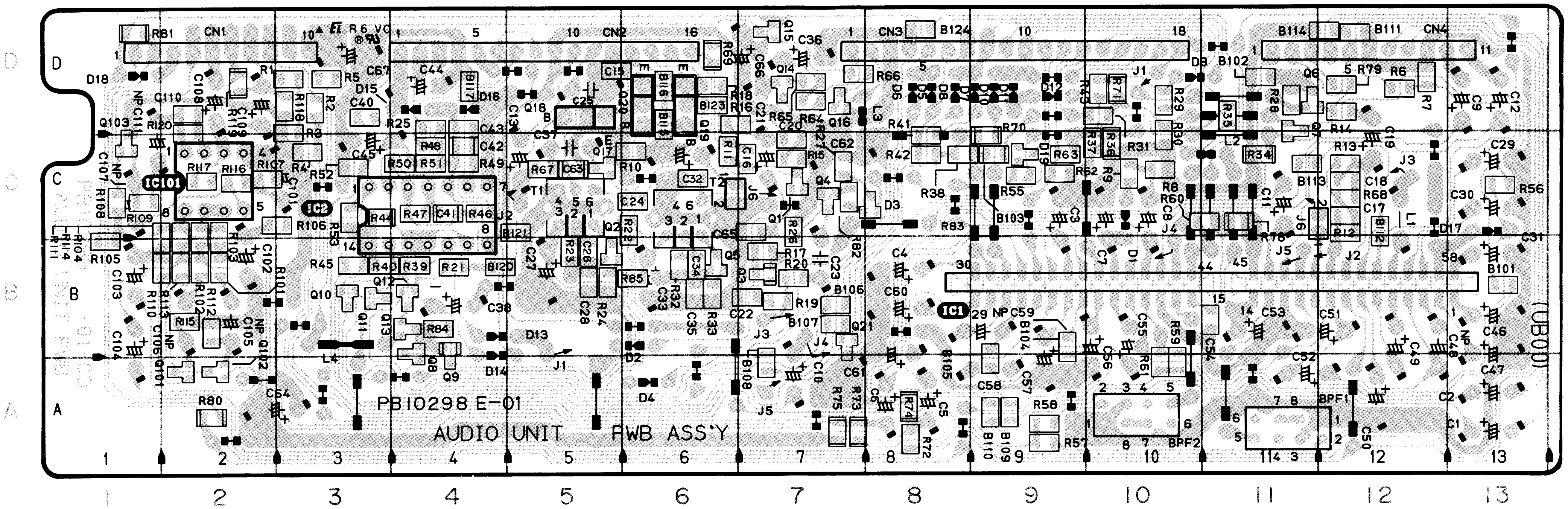
IC101 BA15218
Q101, Q102 2SC4081(QR)
Q103 2SC4081(QR)
Q2, Q5 2SC4081(QR)
IC2 SN74HCU04N
03 AUDIO (MAIN)
37 SW/JACK
R CH LEVEL
L CH LEVEL
UNSW 12V
MIC CTL
MIC
GND
HEADPHONE(R)
HEADPHONE(L)
HEADPHONE LEVEL
AUDIO 11V
EE LEVEL (R CH)
EE LEVEL (L CH)
HIFI REC LEVEL
L CH
R CH
MIC JA703
From / To 37 SW/JACK, CN751 (Page 3-62)
From / To 21 T/D/S, CN702 (Page 3-61)
From / To 43 PRE/REC, CN1 (Page 3-66)
TP354 PB FMA FM
TP332 BIAS−
TP331 BIAS+
PB LEVEL
BIAS ADJ
12 A/C HEAD
R/P
A. E
TP334 ERASE
F. E
REC 52 Vp-p
From / To 03 SERVO (MAIN) (Page 3-47, 48)
From 03 REGULATOR (MAIN) (Page 3-30)
From 03 MECHACON (MAIN) (Page 3-52)
To 03 VIDEO (MAIN) (Page 3-35)
From 03 DEMOD (MAIN) (Page 3-46)
REC/PB 1.1 Vp-p
TP374 AUDIO OUT(L)
TP373 AUDIO OUT(R)
AUDIO OUT 1
AUDIO OUT 2
LEVEL IND(L)
LEVEL IND(R)
REC 0.9 Vp-p
TP372 AUDIO IN(L)
TP371 AUDIO IN(R)
37 SW/JACK
AUDIO JA701
Q1, Q17 2SC4081(QR)
Q19, Q20 2SD1450S,T
Q7 2SC4081(QR)
Q11 DTC114EU
Q10, Q13 DTA114EU
Q18 2SC1740S(RS)
Q8 DTA114EU
Q12 DTC143TU
Q14 2SC4097(QR)
Q15 2SA1577(QR)
Q16 DTC124EU
Q6 2SC4097(QR)
Q21 DTA114TU
UNSW 12V
SWD 5V
AUDIO 11V
D
E
F
G
H
I
J
K

3.20 AUDIO UNIT AND DEMODULATOR CIRCUIT BOARDS

Note: Double edging indicates not used in this model.
Examples; Resistor, Capacitor, Transistor, DIODE

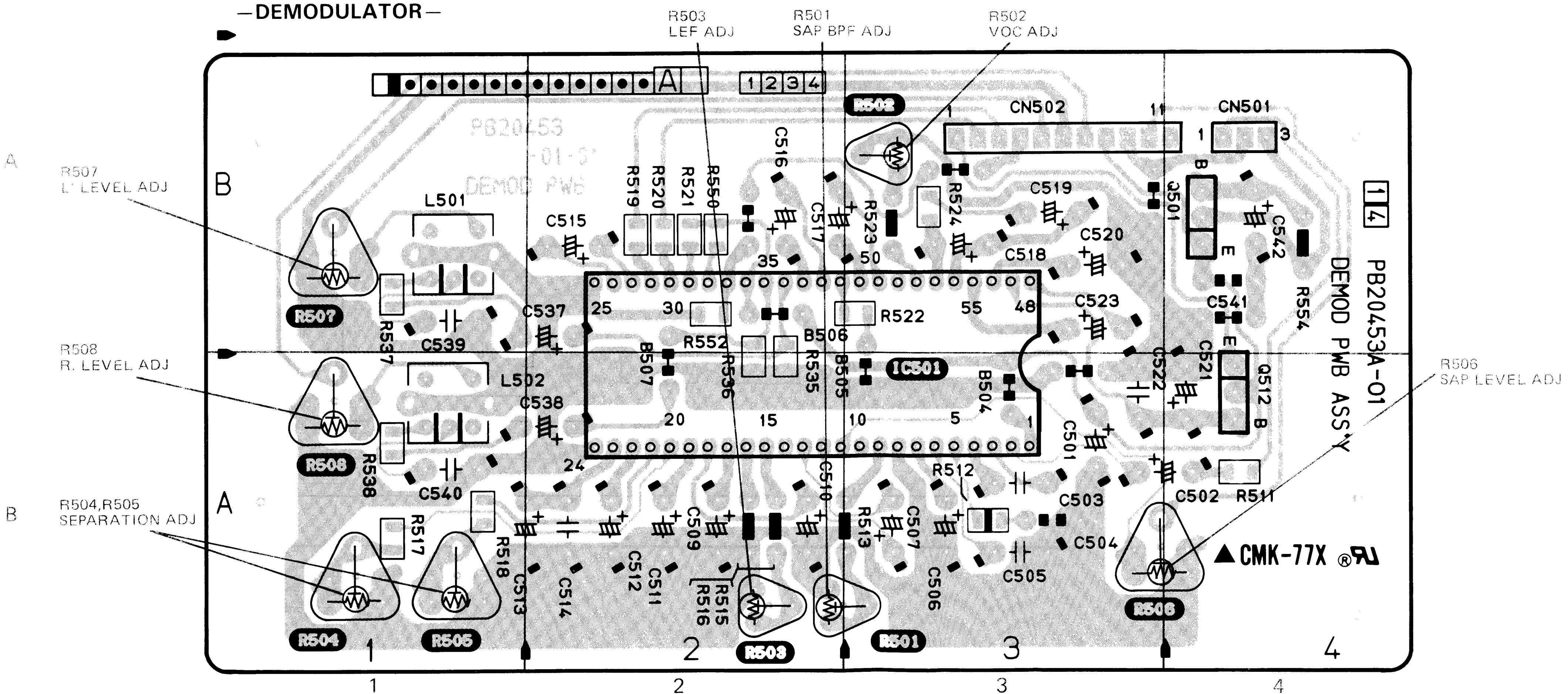


—AUDIO UNIT—



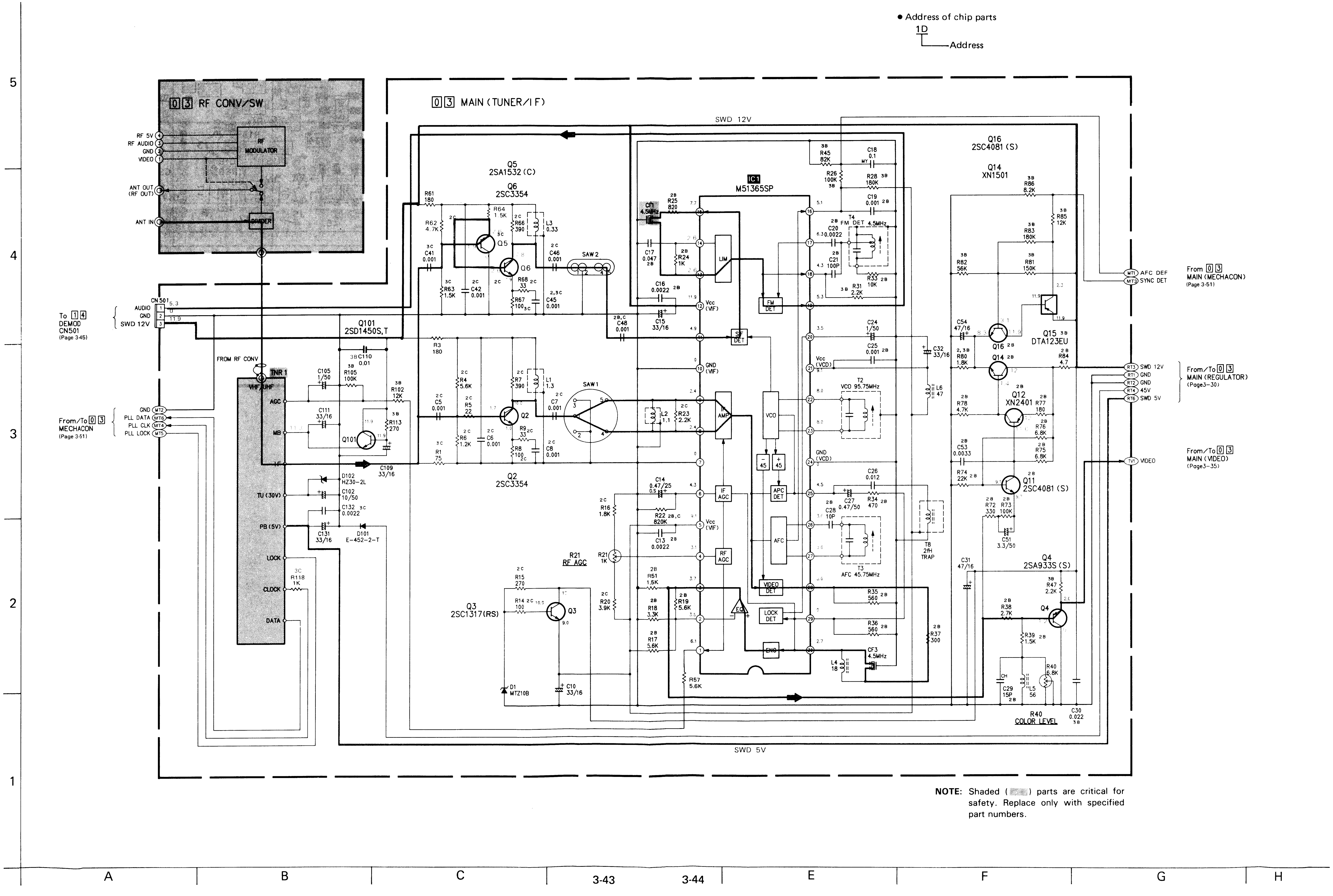
CN1
CN2
CN3
CN4
IC101
IC2
IC1
R81
D18
Q103
R120
R117
R116
R107
R106
R105
R108
R109
C107
C110
C108
R5
R2
C40
C67
D15
R6 VC
C44
B117
D16
C13
Q18
C25
C15
B116
B115
B123
R69
C66
Q14
R18
R16
C21
R65
C20
R64
R27
Q16
C62
R15
Q4
Q1
B124
R66
D6
D8
D12
R41
R42
R38
R83
D3
R70
D19
R63
R62
R55
B103
R71
R43
J1
R29
R30
R31
R8
R60
R28
R35
R34
L2
Q6
B102
D9
B114
B111
R79
R6
R7
C9
C12
R14
R13
C19
C29
B113
C18
R68
C17
J3
L1
C30
R56
D17
C31
B101
R12
B112
J6
J2
J5
J4
R78
R48
R50
R51
R47
C41
R46
C42
R49
C43
C37
R67
C63
Q17
R10
C32
T2
T1
C24
R22
R23
C26
Q2
R26
R17
R20
C23
R82
R44
R40
R39
R21
B120
B121
C27
R85
R32
C33
C34
Q5
Q3
R45
Q10
Q11
Q12
Q13
R84
C38
D13
D14
D2
Q8
Q9
L4
J1
R24
C28
C35
R33
C22
R19
B107
B106
Q21
J4
J3
C10
C61
R75
R73
R74
C6
C5
R72
J5
D4
C4
C60
C59
B104
C56
B105
C57
C58
R58
B110
B109
R57
R61
R59
C55
C54
C53
C51
C52
C49
C48
C46
C47
C2
C1
C50
BPF1
BPF2
C7
D1
C3
C8
C11
R111
R114
R104
R113
R110
C106
Q101
R112
R102
R115
C105
Q102
C104
C103
R101
C102
C101
R103
R52
R53
R80
C64
PB10298 E-01
AUDIO UNIT PWB ASS'Y
(UB00)
1
2
3
4
5
6
7
8
9
10
11
12
13
A
B
C
D

—DEMODULATOR—



R503 LEF ADJ
R501 SAP BPF ADJ
R502 VOC ADJ
R507 L' LEVEL ADJ
R508 R. LEVEL ADJ
R504,R505 SEPARATION ADJ
R506 SAP LEVEL ADJ
A
1234
PB20453
DEMOD PWB
CN502
CN501
L501
L502
C515
C516
C517
R519
R520
R521
R550
R523
R524
C519
C520
C518
C542
C523
C541
Q501
R554
C537
C539
R537
C538
C540
R538
R517
R518
R552
R536
B507
R535
B506
B505
R522
IC501
B504
C522
C521
Q512
C501
R512
C503
C502
R511
C504
C505
C506
C507
R513
C510
C509
C511
C512
C513
C514
R515
R516
R507
R508
R504
R505
R503
R501
R502
R506
PB20453A-01
DEMOD PWB ASS'Y
CMK-77X
1
2
3
4
A
B

3.21 TUNER/IF SCHEMATIC DIAGRAMS



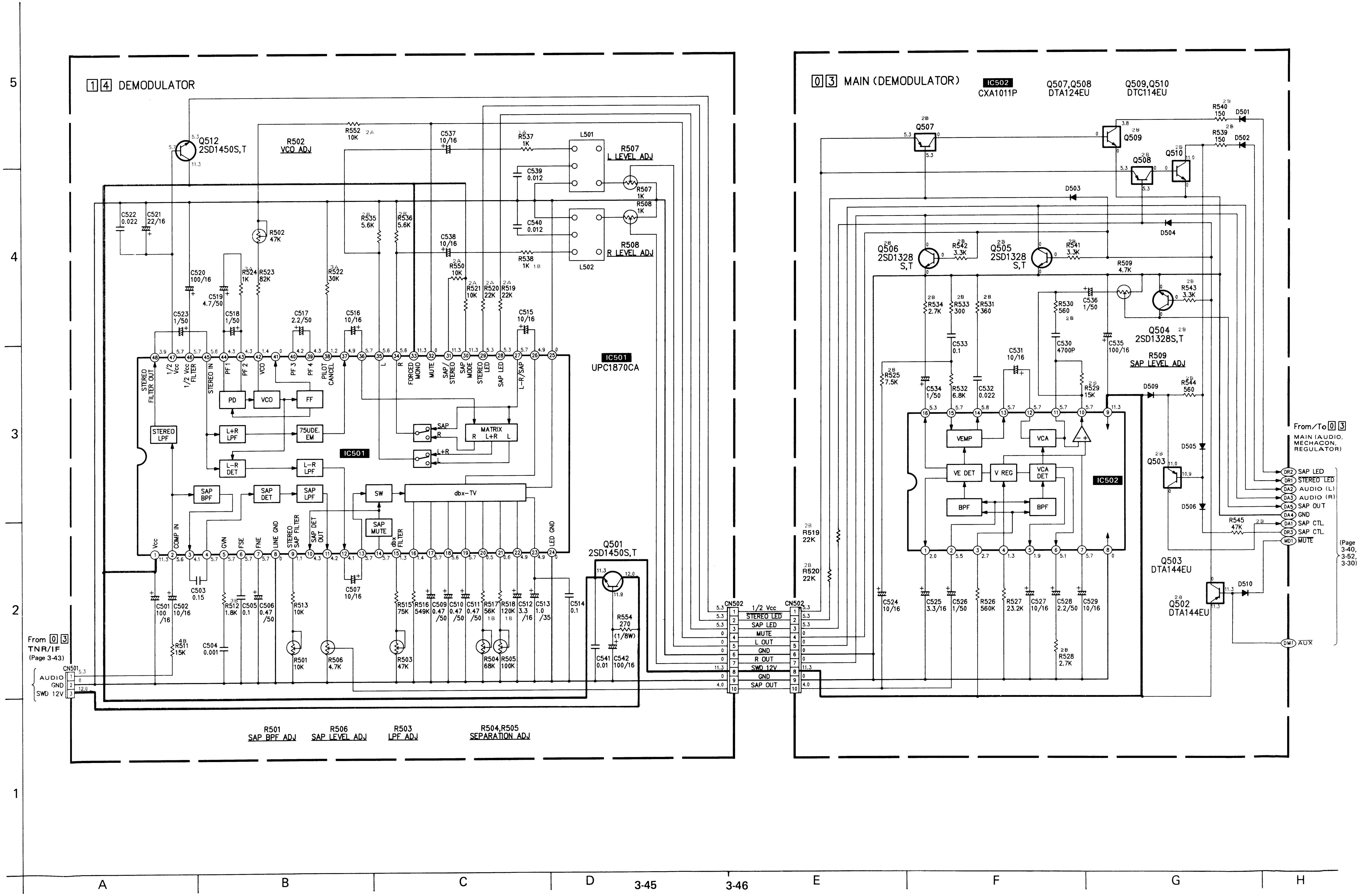
03 RF CONV/SW
RF MODULATOR
DIVIDER
RF 5V
RF AUDIO
GND
VIDEO
ANT OUT (RF OUT)
ANT IN
03 MAIN (TUNER/IF)
SWD 12V
SWD 5V
To 14 DEMOD CN501 (Page 3-45)
CN501
AUDIO
GND
SWD 12V
From/To 03 MECHACON (Page 3-51)
PLL DATA
PLL CLK
PLL LOCK
FROM RF CONV
TNR 1
VHF/UHF
AGC
MB
IF
TU (30V)
PB (5V)
LOCK
CLOCK
DATA
Q101 2SD1450S,T
D102 HZ30-2L
D101 E-452-2-T
Q5 2SA1532 (C)
Q6 2SC3354
Q2 2SC3354
Q3 2SC1317(RS)
D1 MTZ10B
R21 RF AGC
SAW 1
SAW 2
IC1 M51365SP
LIM
FM DET
SIF DET
IF AMP
VCO
APC DET
AFC
IF AGC
RF AGC
VIDEO DET
LOCK DET
EQ
ENG
Vcc (VIF)
GND (VIF)
Vcc (VCD)
GND (VCD)
T4 FM DET 4.5MHz
T2 VCO 95.75MHz
T3 AFC 45.75MHz
T8 2fH TRAP
CF1 4.5MHz
CF3 4.5MHz
Q16 2SC4081 (S)
Q14 XN1501
Q15 DTA123EU
Q12 XN2401
Q11 2SC4081 (S)
Q4 2SA933S (S)
R40 COLOR LEVEL
AFC DEF
SYNC DET
From 03 MAIN (MECHACON) (Page 3-51)
SWD 12V
GND
GND
45V
SWD 5V
From/To 03 MAIN (REGULATOR) (Page 3-30)
VIDEO
From/To 03 MAIN (VIDEO) (Page 3-35)
1
2
3
4
5
A
B
C
E
F
G
H

- Address of chip parts

1D — Address

NOTE: Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

3.22 DEMODULATOR SCHEMATIC DIAGRAM

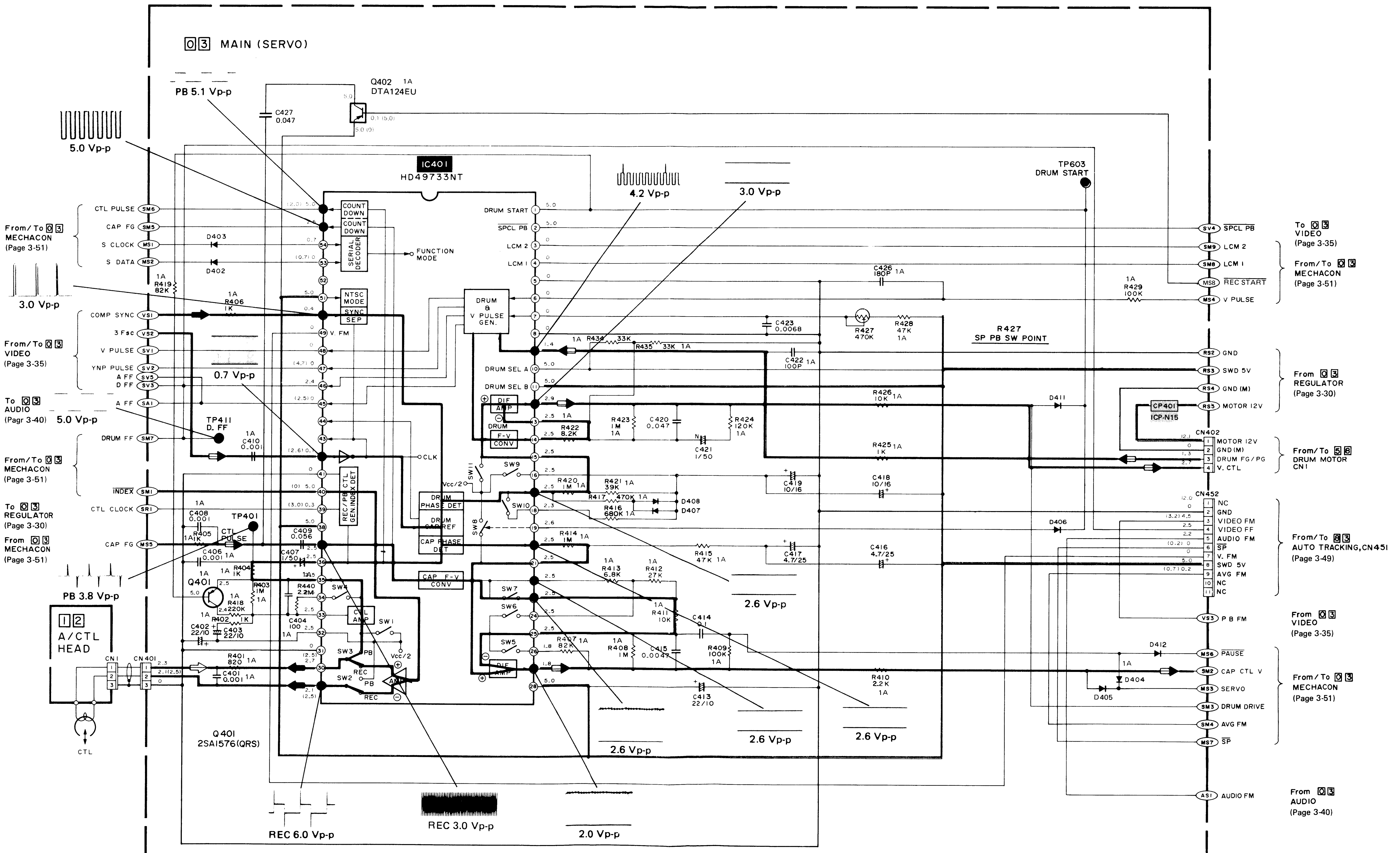


5
4
3
2
1
A
B
C
D
E
F
G
H
14 DEMODULATOR
Q512 2SD1450S,T
R502 VCO ADJ
R552 10K
C537 10/16
R537 1K
L501
R507 L LEVEL ADJ
C539 0.012
R507 1K
R508 1K
C540 0.012
C538 10/16
R538 1K
L502
R508 R LEVEL ADJ
C522 0.022
C521 22/16
R502 47K
R535 5.6K
R536 5.6K
R550 10K
C520 100/16
C519 4.7/50
R524 1K
R523 82K
R522 30K
R521 10K
R520 22K
R519 22K
C523 1/50
C518 1/50
C517 2.2/50
C516 10/16
C515 10/16
IC501 UPC1870CA
STEREO FILTER OUT
1/2 Vcc
1/2 Vcc FILTER
STEREO IN
PF 1
PF 2
VCO
PF 3
PF 4
PILOT CANCEL
L
R
FORCED MONO
MUTE
SAP/STEREO
SAP MODE
STEREO LED
SAP LED
L-R/SAP
PD
VCO
FF
STEREO LPF
L+R LPF
75UDE. EM
MATRIX R L+R L
SAP
L+R
L-R DET
L-R LPF
IC501
SAP BPF
SAP DET
SAP LPF
SW
dbx-TV
SAP MUTE
Vcc
COMP IN
GVN
FSE
FNE
LINE GND
STEREO SAP FILTER
SAP DET OUT
dbx FILTER
LED GND
C503 0.15
C507 10/16
Q501 2SD1450S,T
C501 100/16
C502 10/16
R511 15K
C504 0.001
R512 1.8K
C505 0.1
C506 0.47/50
R513 10K
R501 10K
R506 4.7K
R515 75K
R516 549K
R503 47K
C509 0.47/50
C510 0.47/50
C511 0.47/50
R517 56K
R518 120K
R504 68K
R505 100K
C512 3.3/16
C513 1.0/35
C514 0.1
R554 270 (1/8W)
C541 0.01
C542 100/16
From 03 TNR/IF (Page 3-43)
CN501
AUDIO
GND
SWD 12V
R501 SAP BPF ADJ
R506 SAP LEVEL ADJ
R503 LPF ADJ
R504,R505 SEPARATION ADJ
CN502
1/2 Vcc
STEREO LED
SAP LED
MUTE
L OUT
GND
R OUT
SWD 12V
GND
SAP OUT
03 MAIN (DEMODULATOR)
IC502 CXA1011P
Q507,Q508 DTA124EU
Q509,Q510 DTC114EU
Q507
Q509
R540 150
D501
R539 150
D502
Q510
Q508
D503
D504
Q506 2SD1328 S,T
R542 3.3K
Q505 2SD1328 S,T
R541 3.3K
R509 4.7K
R543 3.3K
R534 2.7K
R533 300
R531 360
R530 560
C536 1/50
Q504 2SD1328S,T
C533 0.1
C530 4700P
C535 100/16
R509 SAP LEVEL ADJ
R525 7.5K
C534 1/50
R532 6.8K
C532 0.022
C531 10/16
R529 15K
D509
R544 560
VEMP
VCA
VE DET
V REG
VCA DET
BPF
BPF
IC502
Q503
D505
D506
R545 47K
From/To 03 MAIN (AUDIO, MECHACON, REGULATOR)
SAP LED
STEREO LED
AUDIO (L)
AUDIO (R)
SAP OUT
GND
SAP CTL
SAP CTL
MUTE
AUX
(Page 3-40, 3-52, 3-30)
R519 22K
R520 22K
C524 10/16
C525 3.3/16
C526 1/50
R526 560K
R527 23.2K
C527 10/16
C528 2.2/50
C529 10/16
R528 2.7K
Q503 DTA144EU
Q502 DTA144EU
D510

3.23 SERVO AND AUTO TRACKING SCHEMATIC DIAGRAMS

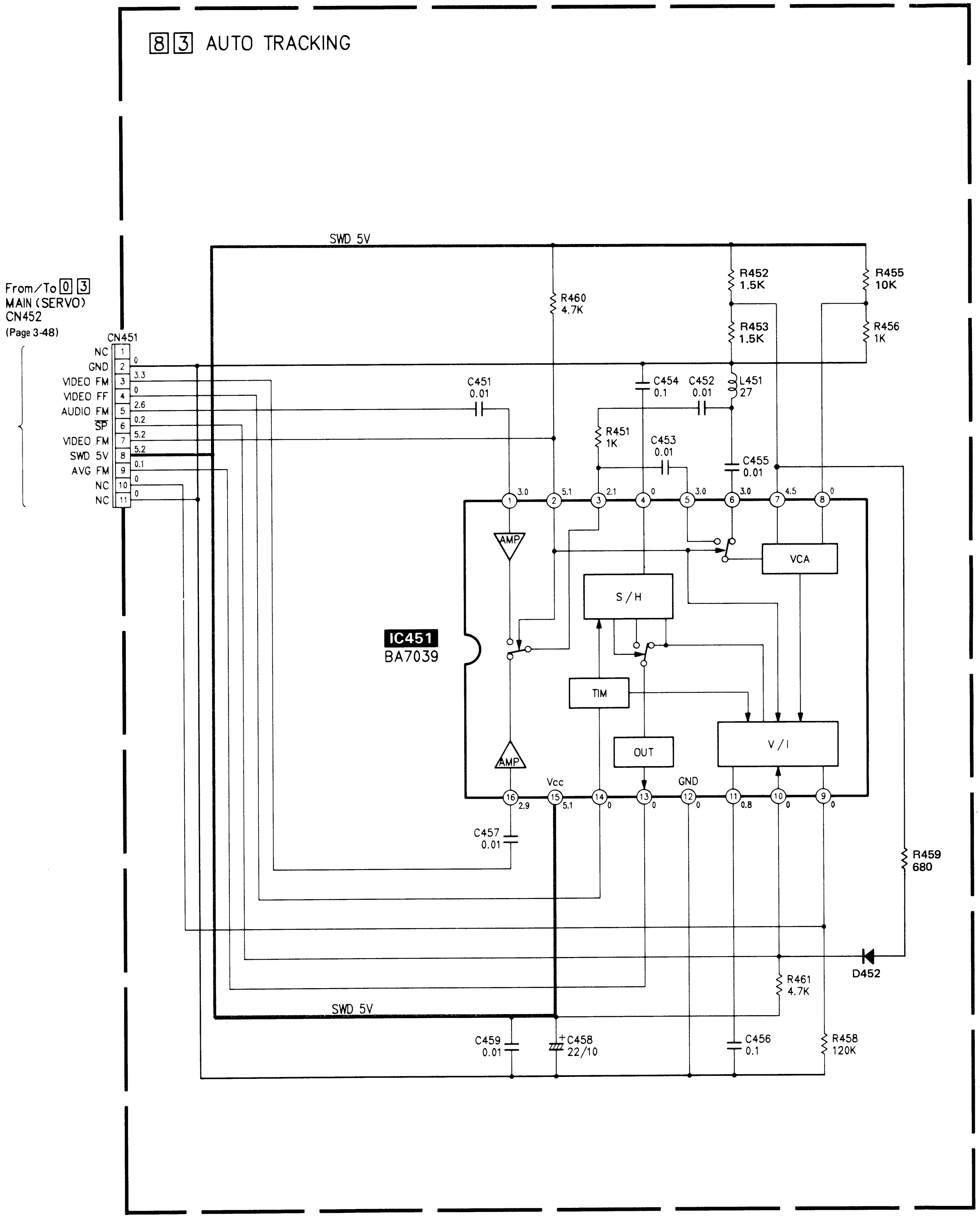
- Address of chip parts
  1D
  └──Address

- Shaded ( ) parts are critical for safety.
  Replace only with specified part numbers.

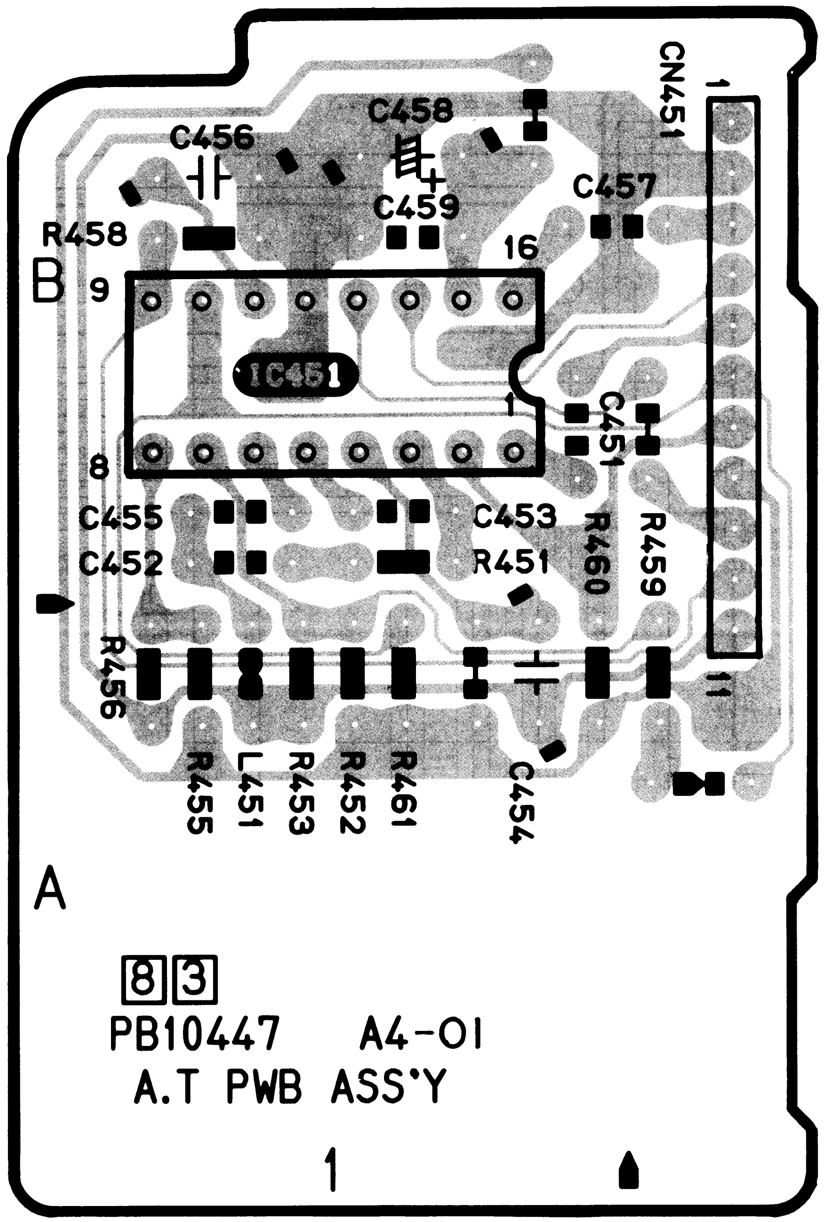


03 MAIN (SERVO)
IC401
HD49733NT
Q402 1A
DTA124EU
C427 0.047
PB 5.1 Vp-p
5.0 Vp-p
3.0 Vp-p
0.7 Vp-p
5.0 Vp-p
PB 3.8 Vp-p
4.2 Vp-p
3.0 Vp-p
2.6 Vp-p
2.6 Vp-p
2.6 Vp-p
2.6 Vp-p
2.0 Vp-p
REC 6.0 Vp-p
REC 3.0 Vp-p
COUNT DOWN
COUNT DOWN
SERIAL DECODER
FUNCTION MODE
NTSC MODE
SYNC SEP
DRUM & V PULSE GEN.
V. FM
CLK
REC/PB CTL GEN INDEX DET
DRUM PHASE DET
DRUM CAP REF
CAP PHASE DET
CAP F-V CONV
DIF AMP
DRUM F-V CONV
CTL AMP
AMP
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SW11
Vcc/2
REC
PB
DRUM START
SPCL PB
LCM 2
LCM 1
DRUM SEL A
DRUM SEL B
CTL PULSE SM6
CAP FG SM5
S CLOCK MS1
S DATA MS2
COMP SYNC VS1
3 Fsc VS2
V PULSE SV1
YNP PULSE SV2
A FF SV5
D FF SV3
A FF SA1
DRUM FF SM7
INDEX SM1
CTL CLOCK SR1
CAP FG MS5
From/To 03 MECHACON (Page 3-51)
From/To 03 VIDEO (Page 3-35)
To 03 AUDIO (Pagr 3-40)
From/To 03 MECHACON (Page 3-51)
To 03 REGULATOR (Page 3-30)
From 03 MECHACON (Page 3-51)
TP411 D. FF
TP401 CTL PULSE
TP603 DRUM START
D403
D402
R419 82K
R406 1K
C410 0.001
C408 0.001
R405 1K
C406 0.001
R404 1K
Q401
R403 1M
R418 220K
R402 1K
C402 22/10
C403 22/10
R401 820
C401 0.001
C409 0.056
C407 1/50
R440 2.2M
C404 100
12 A/CTL HEAD
CN1
CN401
CTL
Q401
2SA1576(QRS)
R434 33K
R435 33K
C423 0.0068
C422 100P
C426 180P
R427 470K
R428 47K
R427 SP PB SW POINT
R429 100K
R426 10K
R425 1K
R422 8.2K
R423 1M
C420 0.047
R424 120K
C421 1/50
R420 1M
R421 39K
R417 470K
R416 680K
D408
D407
C419 10/16
C418 10/16
R414 1M
R415 47K
C417 4.7/25
C416 4.7/25
R413 6.8K
R412 27K
R411 10K
C414 0.1
R407 82K
R408 1M
C415 0.0047
R409 100K
C413 22/10
R410 2.2K
D411
D406
D412
D404
D405
SV4 SPCL PB
SM9 LCM 2
SM8 LCM 1
MS8 REC START
MS4 V PULSE
To 03 VIDEO (Page 3-35)
From/To 03 MECHACON (Page 3-51)
RS2 GND
RS3 SWD 5V
RS4 GND (M)
RS5 MOTOR 12V
From 03 REGULATOR (Page 3-30)
CP401 ICP-N15
CN402
1 MOTOR 12V
2 GND (M)
3 DRUM FG/PG
4 V. CTL
From/To 58 DRUM MOTOR CN1
CN452
1 NC
2 GND
3 VIDEO FM
4 VIDEO FF
5 AUDIO FM
6 SP
7 V. FM
8 SWD 5V
9 AVG FM
10 NC
11 NC
From/To 83 AUTO TRACKING, CN451 (Page 3-49)
VS3 P B FM
From 03 VIDEO (Page 3-35)
MS6 PAUSE
SM2 CAP CTL V
MS3 SERVO
SM3 DRUM DRIVE
SM4 AVG FM
MS7 SP
From/To 03 MECHACON (Page 3-51)
AS1 AUDIO FM
From 03 AUDIO (Page 3-40)
6
5
4
3
2
1
A
B
C
D
E
F
G
H

3.24 AUTO TRACKING CIRCUIT BOARD



8 3 AUTO TRACKING
From/To 0 3
MAIN (SERVO)
CN452
(Page 3-48)
CN451
NC 1 0
GND 2 3.3
VIDEO FM 3 0
VIDEO FF 4 2.6
AUDIO FM 5 0.2
SP 6 5.2
VIDEO FM 7 5.2
SWD 5V 8 0.1
AVG FM 9 0
NC 10 0
NC 11
SWD 5V
R460 4.7K
R452 1.5K
R453 1.5K
R455 10K
R456 1K
C451 0.01
C454 0.1
C452 0.01
L451 27
R451 1K
C453 0.01
C455 0.01
AMP
S/H
VCA
TIM
OUT
V/I
IC451
BA7039
Vcc
GND
C457 0.01
R459 680
D452
R461 4.7K
C459 0.01
C458 22/10
C456 0.1
R458 120K

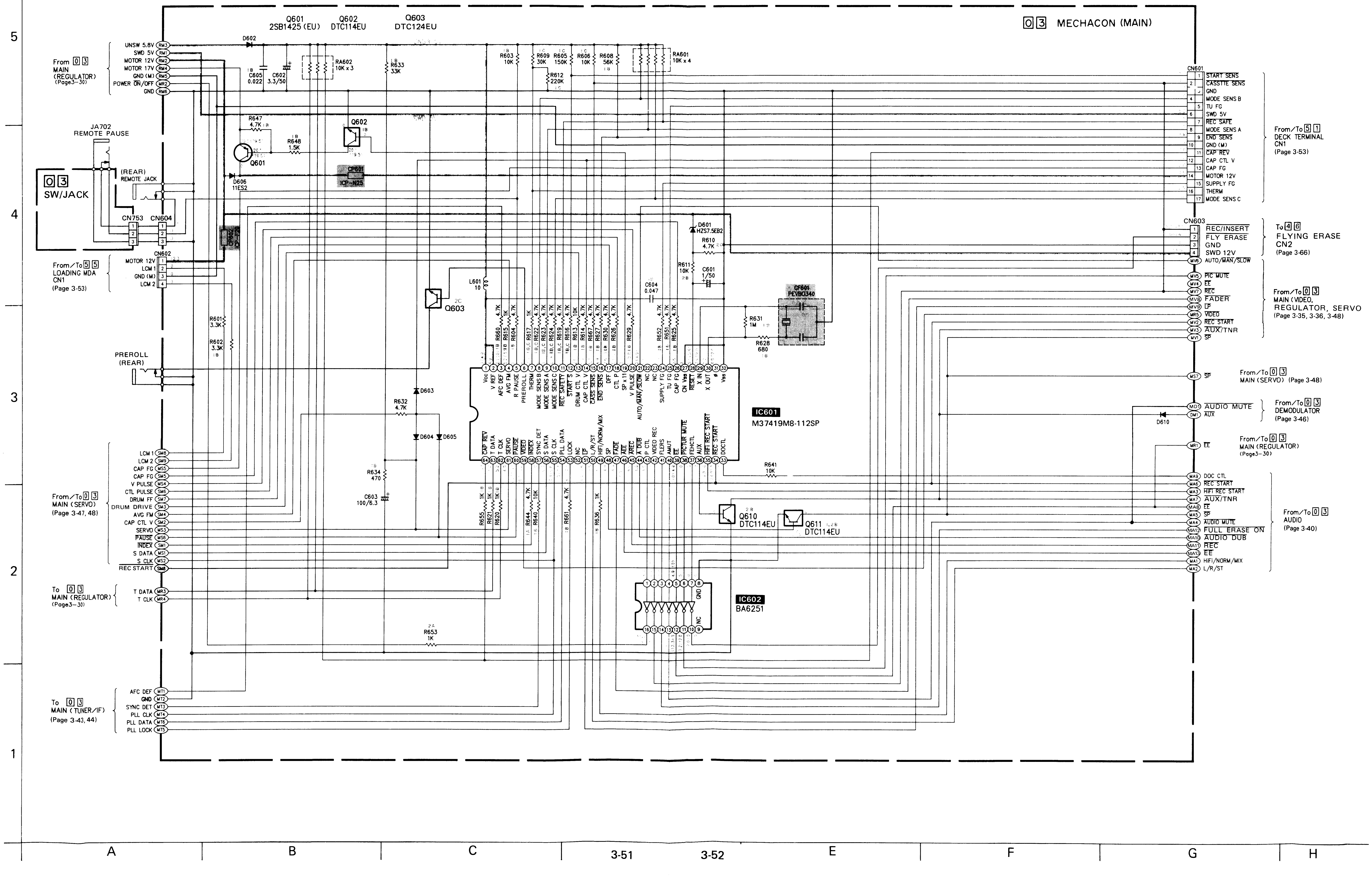


CN451
1
11
C456
C458
C459
C457
R458
B
9
16
IC451
1
8
C451
C455
C452
C453
R451
R460
R459
R456
R455
L451
R453
R452
R461
C454
A
8 3
PB10447 A4-01
A.T PWB ASS'Y
1

3.25 SYSTEM CONTROL SCHEMATIC DIAGRAM

- Address of chip parts
  1D
  Address

- Shaded ( ) parts are critical for safety.
  Replace only with specified part numbers.



03 MECHACON (MAIN)
Q601 2SB1425 (EU)
Q602 DTC114EU
Q603 DTC124EU
From 03 MAIN (REGULATOR) (Page3-30)
UNSW 5.8V RM3
SWD 5V RM1
MOTOR 12V RM2
MOTOR 17V RM4
GND (M) RM5
POWER ON/OFF MR2
GND RM6
D602
C605 0.022
C602 3.3/50
RA602 10K x 3
R633 33K
R603 10K
R609 30K
R605 150K
R606 10K
R608 56K
R612 220K
RA601 10K x 4
R647 4.7K
R648 1.5K
Q601
Q602
CF601 ICP-N25
D606 11ES2
JA702 REMOTE PAUSE
(REAR) REMOTE JACK
03 SW/JACK
CN753
CN604
CP602 ICP-F20
CN602
From/To 55 LOADING MDA CN1 (Page 3-53)
MOTOR 12V
LCM 1
GND (M)
LCM 2
R601 3.3K
R602 3.3K
PREROLL (REAR)
L601 10
Q603
D603
R632 4.7K
D604
D605
R634 470
C603 100/6.3
D601 HZS7.5EB2
R610 4.7K
R611 10K
C601 1/50
C604 0.047
CF601 PEVB0340
R631 1M
R628 680
IC601 M37419M8-112SP
Vcc
V REF
AFC DEF
AVG FM
R PAUSE
PREROLL
THERM
MODE SENS B
MODE SENS A
MODE SENS C
REC SAFETY
START S
DRUM CTL V
CAP CTL V
CASS SENS
END SENS
DFF
CTL P
SP x 11
V PULSE
AUTO/MAN/SLOW
NC
SUPPLY FG
TU FG
CAP FG
CN Vss
RESET
X IN
X OUT
Vss
CAP REV
T DATA
T CLK
SERVO
PAUSE
VIDEO
INDEX
SYNC DET
S DATA
S CLK
PLL DATA
LOCK
LP
L/R/ST
HIFI/NORM/MIX
SP
FADE
AEE
AREC
A DUB
P CTL
VIDEO REC
FLERS
AMUT
EE
PICTUR MUTE
FEHCTL
AUX
HIFI REC START
REC START
DOCTL
R641 10K
Q610 DTC114EU
Q611 DTC114EU
IC602 BA6251
GND
NC
R653 1K
From/To 03 MAIN (SERVO) (Page 3-47, 48)
LCM 1 SM8
LCM 2 SM9
CAP FG MS5
CAP FG SM5
V PULSE MS4
CTL PULSE SM6
DRUM FF SM7
DRUM DRIVE SM3
AVG FM SM4
CAP CTL V SM2
SERVO MS3
PAUSE MS6
INDEX SM1
S DATA MS1
S CLK MS2
REC START SM8
To 03 MAIN (REGULATOR) (Page3-30)
T DATA MR3
T CLK MR4
To 03 MAIN (TUNER/IF) (Page 3-43, 44)
AFC DEF MT1
GND MT2
SYNC DET MT3
PLL CLK MT4
PLL DATA MT6
PLL LOCK MT5
CN601
START SENS
CASSTTE SENS
GND
MODE SENS B
TU FG
SWD 5V
REC SAFE
MODE SENS A
END SENS
GND (M)
CAP REV
CAP CTL V
CAP FG
MOTOR 12V
SUPPLY FG
THERM
MODE SENS C
From/To 51 DECK TERMINAL CN1 (Page 3-53)
CN603
REC/INSERT
FLY ERASE
GND
SWD 12V
To 46 FLYING ERASE CN2 (Page 3-66)
AUTO/MAN/SLOW MV6
PIC MUTE MV5
EE MV4
REC MV7
FADER MV8
LP MV9
VIDEO MR5
REC START MV2
AUX/TNR MV3
SP MV1
From/To 03 MAIN (VIDEO, REGULATOR, SERVO (Page 3-35, 3-36, 3-48)
SP MS7
From/To 03 MAIN (SERVO) (Page 3-48)
AUDIO MUTE MD1
AUX DM1
D610
From/To 03 DEMODULATOR (Page 3-46)
EE MR1
From/To 03 MAIN (REGULATOR) (Page3-30)
DOC CTL MA9
REC START MA6
HIFI REC START MA3
AUX/TNR MA7
EE MA8
SP MA5
AUDIO MUTE MA4
FULL ERASE ON MA12
AUDIO DUB MA10
REC MA11
EE MA13
HIFI/NORM/MIX MA1
L/R/ST MA2
From/To 03 AUDIO (Page 3-40)
1
2
3
4
5
A
B
C
E
F
G
H

6

3.26 DECK TERMINAL, LOADING MDA, CASS. HOUSING AND CAPSTAN MDA SCHEMATIC DIAGRAMS

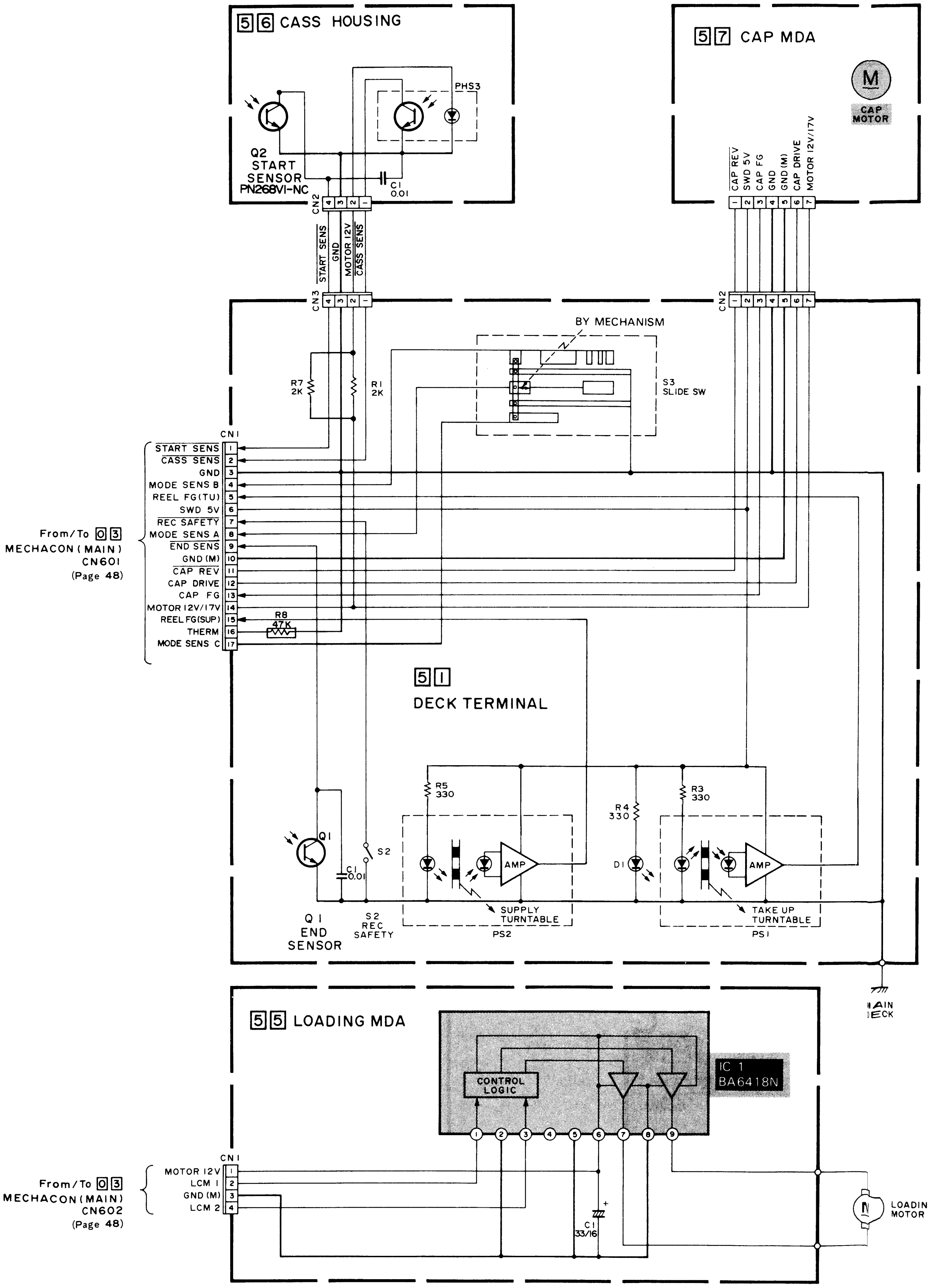
5

4

3

2

1

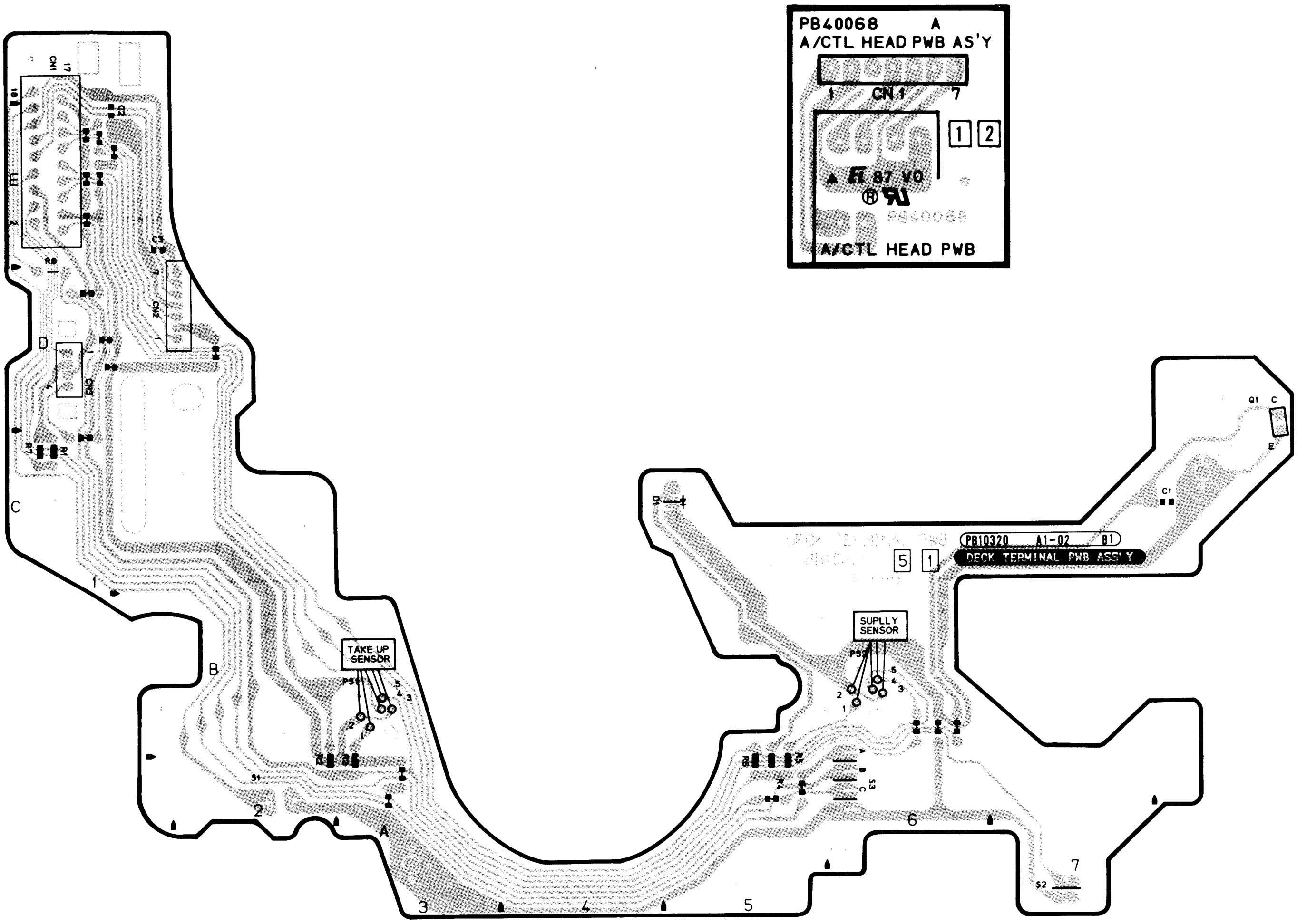


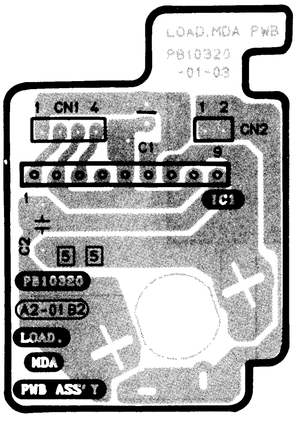
56 CASS HOUSING
Q2 START SENSOR PN268VI-NC
PHS3
C1 0.01
CN2
START SENS
GND
MOTOR 12V
CASS SENS
CN3
57 CAP MDA
M
CAP MOTOR
CAP REV
SWD 5V
CAP FG
GND
GND (M)
CAP DRIVE
MOTOR 12V/17V
CN2
BY MECHANISM
S3 SLIDE SW
R7 2K
R1 2K
CN1
START SENS
CASS SENS
GND
MODE SENS B
REEL FG(TU)
SWD 5V
REC SAFETY
MODE SENS A
END SENS
GND (M)
CAP REV
CAP DRIVE
CAP FG
MOTOR 12V/17V
REEL FG(SUP)
THERM
MODE SENS C
R8 47K
From/To 03 MECHACON (MAIN) CN601 (Page 48)
51 DECK TERMINAL
R5 330
R4 330
R3 330
D1
Q1
S2
C1 0.01
AMP
SUPPLY TURNTABLE
PS2
TAKE UP TURNTABLE
PS1
Q1 END SENSOR
S2 REC SAFETY
MAIN DECK
55 LOADING MDA
CONTROL LOGIC
IC 1 BA6418N
1 2 3 4 5 6 7 8 9
CN1
MOTOR 12V
LCM 1
GND (M)
LCM 2
From/To 03 MECHACON (MAIN) CN602 (Page 48)
C1 33/16
LOADING MOTOR

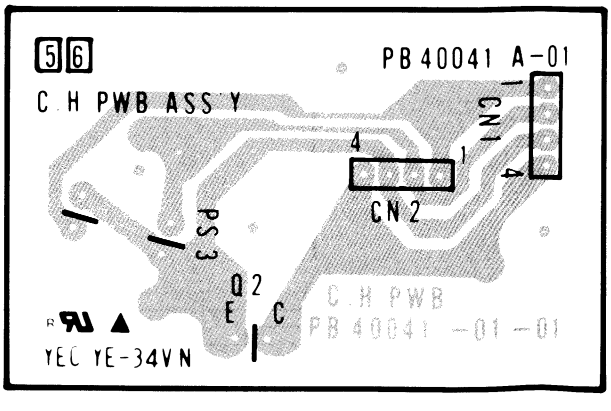
- Shaded (▨) parts are critical for safety.
  Replace only with specified part numbers.

A B C D

3.27 DECK TERMINAL, LOADING MDA, CASS. HOUSING AND CAPSTAN MDA CIRCUIT BOARDS


PB40068 A
A/CTL HEAD PWB AS'Y
1
CN1
7
1 2
87 V0
PB40068
A/CTL HEAD PWB
CN1
17
18
2
CN2
CN3
C3
R8
R7
R1
C
D
E
1
B
A
2
3
4
5
6
7
TAKE UP SENSOR
PS1
SUPLLY SENSOR
PS2
S1
S2
S3
R2
R3
R4
R5
R6
D1
Q1
C1
PB10320 A1-02 B1
DECK TERMINAL PWB ASS'Y
5 1

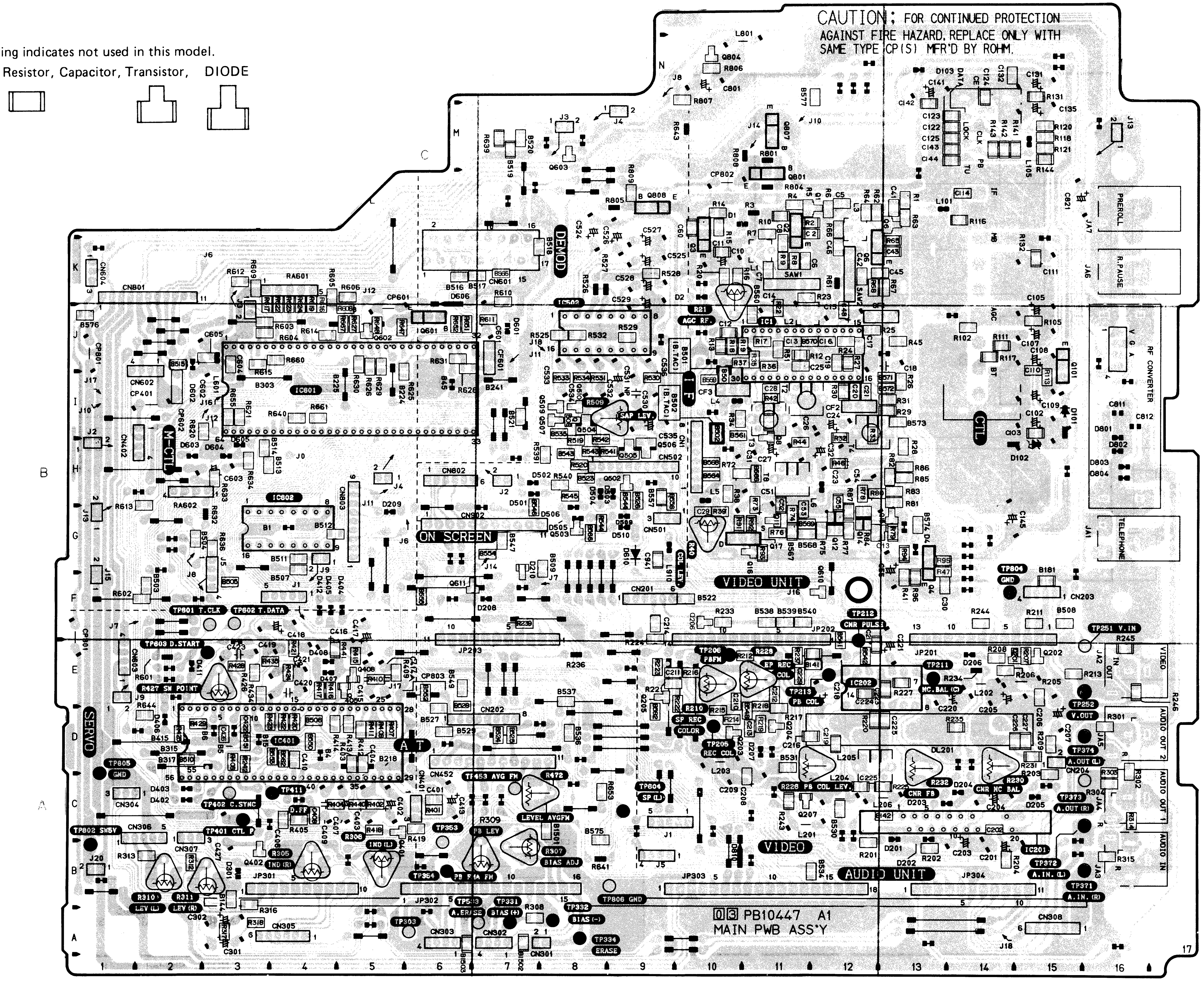

LOAD.MDA PWB
PB10320
-01-03
1 CN1 4
1 2
CN2
C1
9
1
IC1
C2
5 5
PB10320
A2-01 B2
LOAD.
MDA
PWB ASS'Y


5 6
PB 40041 A-01
C.H PWB ASS'Y
CN1
1
4
CN2
PS3
Q2
E C
YEC YE-34VN
C.H PWB
PB 40041 -01-01

3.28 MAIN CIRCUIT BOARD

Note: Double edging indicates not used in this model.

Examples; Resistor, Capacitor, Transistor, DIODE

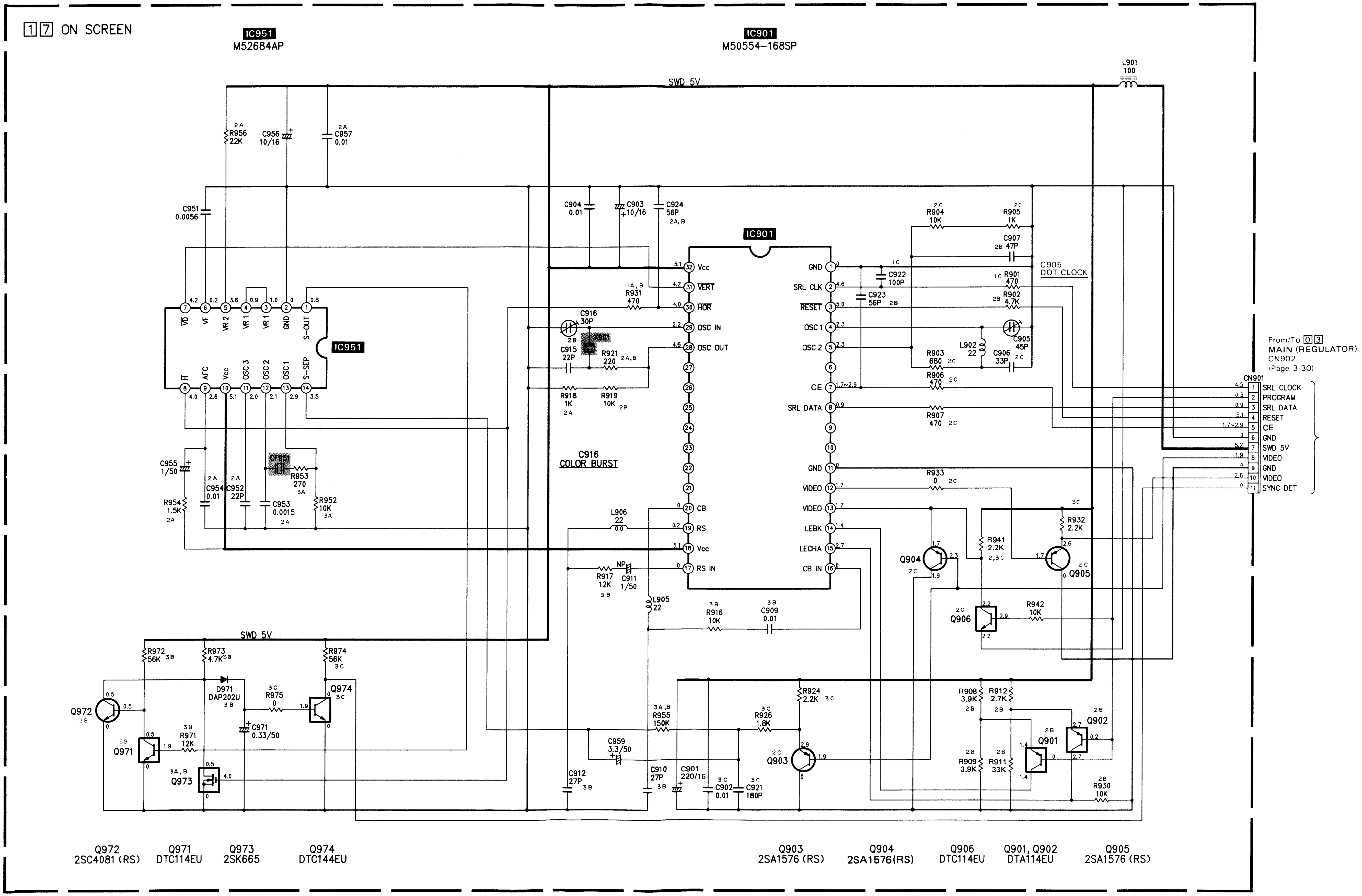


CAUTION; FOR CONTINUED PROTECTION AGAINST FIRE HAZARD, REPLACE ONLY WITH SAME TYPE CP(S) MFR'D BY ROHM.
DEMOD
IC502
IC1
AGC RF
IF
IC601
M-CTL
IC602
ON SCREEN
VIDEO UNIT
CTL
PREROLL
R.PAUSE
RF CONVERTER
TELEPHONE
SERVO
IC401
A.T
TP805 GND
TP802 SW5V
TP601 T.CLK
TP602 T.DATA
TP603 D.START
R427 SW POINT
TP402 C.SYNC
TP401 CTL P
TP411
R310 LEV (L)
R311 LEV (R)
IND (L)
IND (R)
TP364
PB F/A FH
TP353
PB LEV
LEVEL AVGFM
TP453 AVG FM
R472
R307 BIAS ADJ
TP303
TP313 A.ER/SE
TP331 BIAS (+)
TP332 BIAS (-)
TP334 ERASE
TP806 GND
TP604 SP (L)
VIDEO
AUDIO UNIT
PB10447 A1
MAIN PWB ASS'Y
TP206 PBFM
R229
EP REC COL
TP213 PB COL
R210 SP REC COLOR
TP205 REC COL
R228 PB COL LEV.
IC202
TP211 MC.BAL (C)
R232 CNR FB
R230 CNR NC BAL
IC201
TP212 CNR PULSE
TP804 GND
TP251 V.IN
TP252 V.OUT
TP374 A.OUT (L)
TP373 A.OUT (R)
TP372 A.IN. (L)
TP371 A.IN. (R)
VIDEO
AUDIO OUT 2
AUDIO OUT 1
AUDIO IN
JP201
JP202
JP203
JP301
JP302
JP303
JP304
CN801
CN802
CN201
CN202
CN203
CN204
CN301
CN302
CN303
CN305
CN306
CN307
CN308
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
A B C D E F G H I J K L M N

6
5
4
3
2
1
A
B
C
D
E
F
G
H

3.29 ON SCREEN SCHEMATIC DIAGRAM

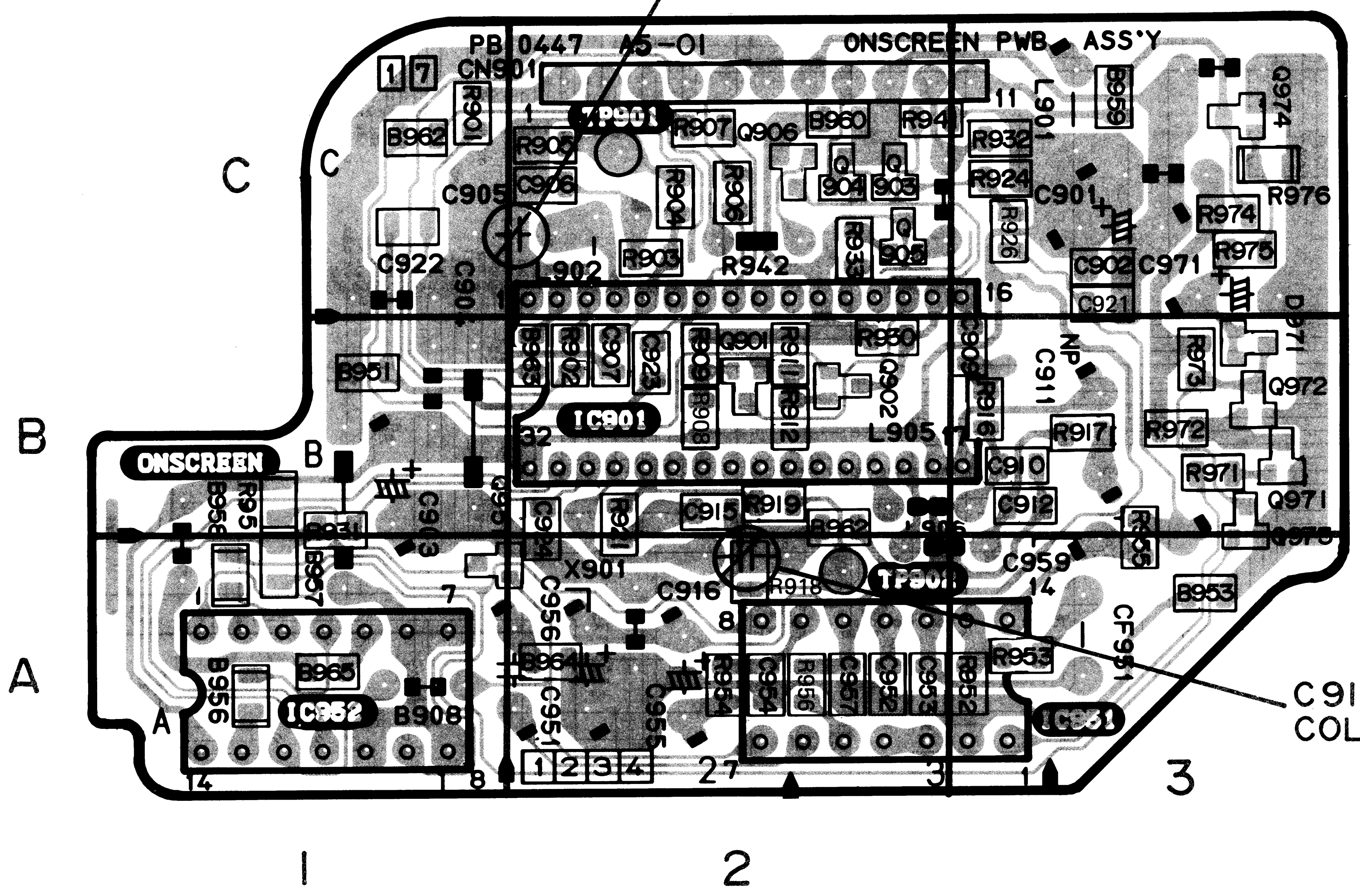
- Address of chip parts
1D
└──Address


1 7 ON SCREEN
IC951
M52684AP
IC901
M50554-168SP
SWD 5V
L901
100
R956 22K 2A
C956 10/16
C957 0.01 2A
C951 0.0056
C904 0.01
C903 10/16
C924 56P 2A,B
R904 10K 2C
R905 1K 2C
C907 47P 2B
C905 DOT CLOCK
C922 100P 1C
C923 56P 2B
R901 470 1C
R902 4.7K 2B
C905 45P
L902 22
C906 33P 2C
R903 680 2C
R906 470 2C
R907 470 2C
R933 0 2C
R931 470 1A,B
C916 30P 2B
X901
C915 22P
R921 220 2A,B
R918 1K 2A
R919 10K 2B
C916 COLOR BURST
VD VF VR 2 VR 1 VR 1 GND S-OUT
H AFC Vcc OSC 3 OSC 2 OSC 1 S-SEP
IC951
C955 1/50
R954 1.5K 2A
C954 0.01 2A
C952 22P 2A
CF951
R953 270 3A
C953 0.0015 2A
R952 10K 3A
Vcc VERT HOR OSC IN OSC OUT CB RS Vcc RS IN
GND SRL CLK RESET OSC 1 OSC 2 CE SRL DATA GND VIDEO VIDEO LEBK LECHA CB IN
L906 22
R917 12K 3B
C911 1/50 NP
L905 22
R916 10K 3B
C909 0.01 3B
Q904 2C
R941 2.2K 2,3C
R932 2.2K 3C
Q905 2C
Q906 2C
R942 10K
From/To 0 3
MAIN (REGULATOR)
CN902
(Page 3-30)
CN901
SRL CLOCK
PROGRAM
SRL DATA
RESET
CE
GND
SWD 5V
VIDEO
GND
VIDEO
SYNC DET
SWD 5V
R972 56K 3B
R973 4.7K 3B
R974 56K 3C
Q972 3B
D971 DAP202U 3B
R975 0 3C
Q974 3C
Q971 3B
R971 12K 3B
C971 0.33/50
Q973 3A,B
R955 150K 3A,B
C959 3.3/50
C912 27P 3B
C910 27P 3B
C901 220/16
C902 0.01 3C
C921 180P 3C
R924 2.2K 3C
R926 1.8K 3C
Q903 2C
R908 3.9K 2B
R912 2.7K 2B
R909 3.9K 2B
R911 33K 2B
Q901 2B
Q902 2B
R930 10K 2B
Q972 2SC4081 (RS)
Q971 DTC114EU
Q973 2SK665
Q974 DTC144EU
Q903 2SA1576 (RS)
Q904 2SA1576(RS)
Q906 DTC114EU
Q901, Q902 DTA114EU
Q905 2SA1576 (RS)

NOTE: Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

3.30 ON SCREEN CIRCUIT BOARD

C905
DOT CLOCK

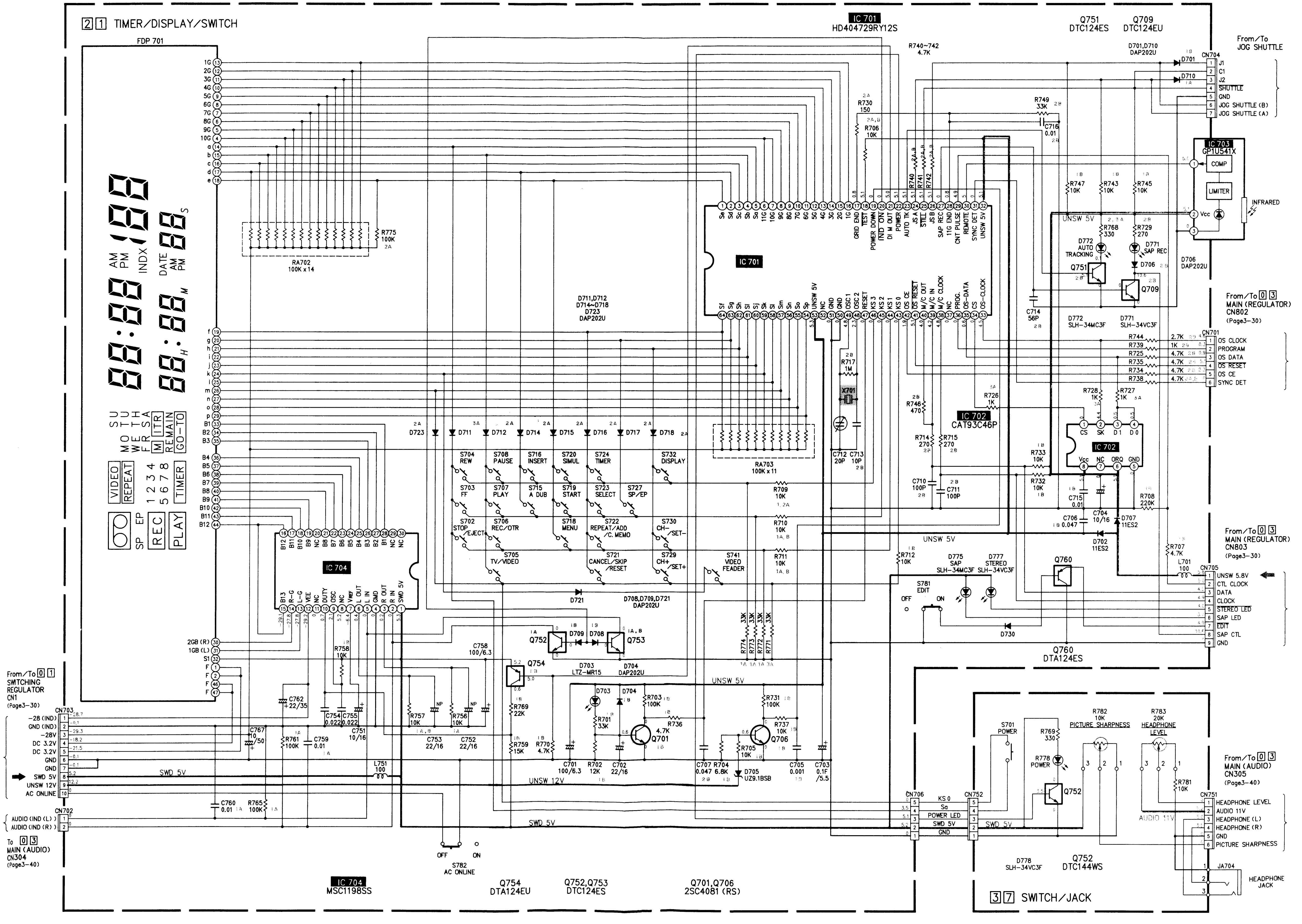

PB 0447 A5-01
ONSCREEN PWB ASS'Y
CN901
TP901
TP902
IC901
IC951
IC952
ONSCREEN
C
B
A
1
2
3
C905
C906
C922
C903
C907
C901
C902
C971
C921
C911
C910
C912
C915
C916
C956
C951
C955
C959
C954
C957
C952
C953
CF951
R901
R902
R903
R904
R906
R907
R909
R911
R912
R917
R918
R919
R921
R924
R926
R930
R932
R933
R941
R942
R951
R952
R953
R954
R956
R971
R972
R973
R974
R975
R976
Q901
Q902
Q904
Q905
Q906
Q971
Q972
Q974
L901
L902
L905
L906
X901
D971
B908
B951
B953
B956
B957
B959
B960
B962
B963
B964
B965
NP
1
7
8
11
14
16
27
32

C916
COLOR BURST CLOCK

3.31 TIMER/DISPLAY/SWITCH AND SWITCH/JACK SCHEMATIC DIAGRAMS

● Address of chip parts
1D
Address

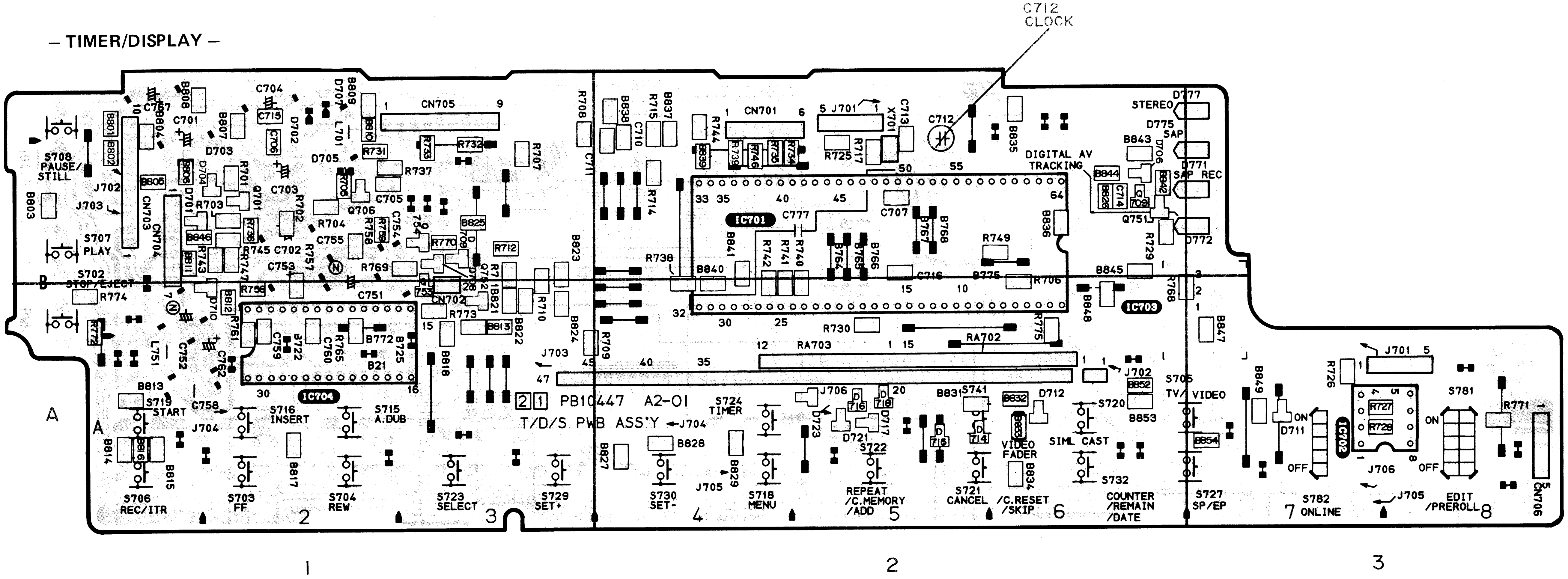
NOTE: Shaded (▨) parts are critical for safety. Replace only with specified part numbers.



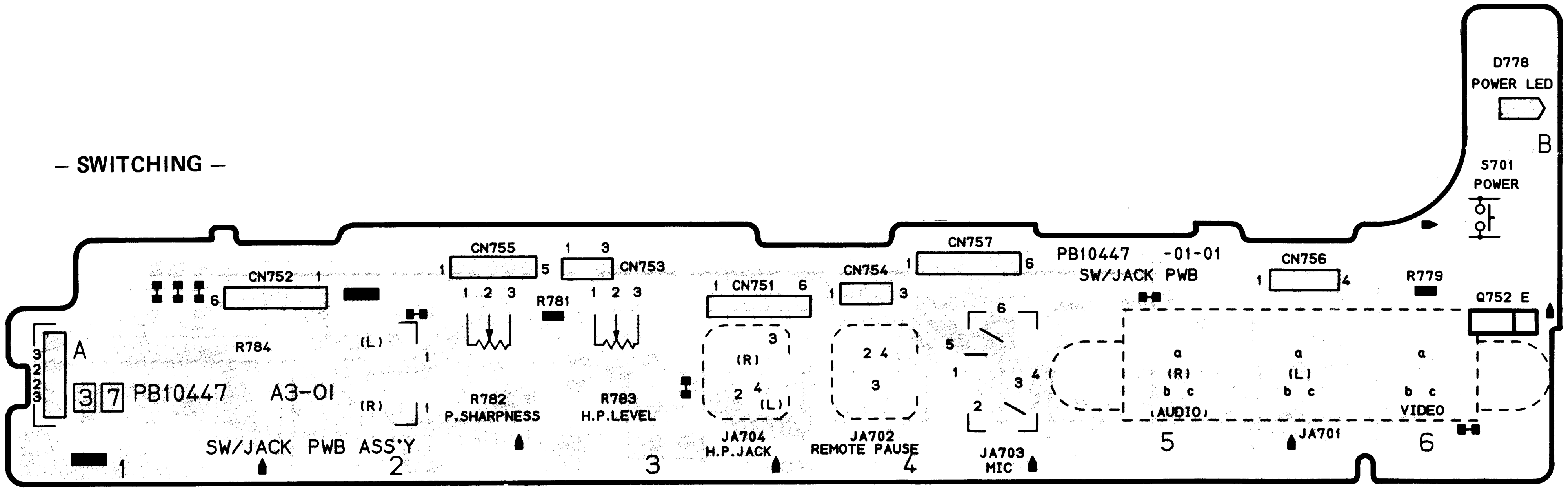
2 1 TIMER/DISPLAY/SWITCH
FDP 701
IC 701
HD404729RY12S
IC 702
CAT93C46P
IC 703
GP1U541X
COMP
LIMITER
INFRARED
IC 704
MSC1198SS
Q751 DTC124ES
Q709 DTC124EU
D701,D710 DAP202U
From/To JOG SHUTTLE
CN704
J1
C1
J2
SHUTTLE
GND
JOG SHUTTLE (B)
JOG SHUTTLE (A)
R740~742 4.7K
R730 150
R706 10K
R749 33K
C716 0.01
R747 10K
R743 10K
R745 10K
R768 330
R729 270
D772 AUTO TRACKING
D771 SAP REC
D706 DAP202U
C714 56P
D772 SLH-34MC3F
D771 SLH-34VC3F
From/To 0 3 MAIN (REGULATOR) CN802 (Page3-30)
CN701
OS CLOCK
PROGRAM
OS DATA
OS RESET
OS CE
SYNC DET
R744 2.7K
R739 1K
R725 4.7K
R735 4.7K
R734 4.7K
R738 4.7K
R728 1K
R727 1K
R726 1K
R746 470
R717 1M
X701
C712 20P
C713 10P
R714 270
R715 270
R733 10K
R732 10K
C710 100P
C711 100P
C715 0.01
C706 0.047
C704 10/16
D707 11ES2
D702 11ES2
R708 220K
RA702 100K x 14
R775 100K
RA703 100K x 11
D711,D712 D714~D718 D723 DAP202U
D723 D711 D712 D714 D715 D716 D717 D718
S704 REW
S708 PAUSE
S716 INSERT
S720 SIMUL
S724 TIMER
S732 DISPLAY
S703 FF
S707 PLAY
S715 A DUB
S719 START
S723 SELECT
S727 SP/EP
S702 STOP/EJECT
S706 REC/OTR
S718 MENU
S722 REPEAT/ADD /C. MEMO
S730 CH-/SET-
S705 TV/VIDEO
S721 CANCEL/SKIP /RESET
S729 CH+/SET+
S741 VIDEO FEADER
R709 10K
R710 10K
R711 10K
R712 10K
D721
D708,D709,D721 DAP202U
R774 R773 R772 R771 33K
UNSW 5V
D775 SAP SLH-34MC3F
D777 STEREO SLH-34VC3F
S781 EDIT OFF ON
Q760
D730
Q760 DTA124ES
From/To 0 3 MAIN (REGULATOR) CN803 (Page3-30)
R707 4.7K
L701 100
CN705
UNSW 5.8V
CTL CLOCK
DATA
CLOCK
STEREO LED
SAP LED
EDIT
SAP CTL
GND
Q752 Q753 D709 D708
D703 LTZ-MR15
D704 DAP202U
Q754
C758 100/6.3
R758 10K
C762 22/35
C754 0.022
C755 0.022
C751 10/16
R761 100K
C759 0.01
C767 10/50
R757 10K
R756 10K
C753 22/16
C752 22/16
R769 22K
R759 15K
R770 4.7K
C701 100/6.3
R702 12K
C702 22/16
R701 33K
R703 100K
R736 4.7K
Q701
R731 100K
R737 10K
Q706
R705 10K
C707 0.047
R704 6.8K
D705 UZ9.1BSB
C705 0.001
C703 0.1F /5.5
From/To 0 1 SWITCHING REGULATOR CN1 (Page3-30)
CN703
-28 (IND)
GND (IND)
-28V
DC 3.2V
DC 3.2V
GND
GND
SWD 5V
UNSW 12V
AC ONLINE
L751 100
C760 0.01
R765 100K
CN702
AUDIO (IND (L))
AUDIO (IND (R))
To 0 3 MAIN (AUDIO) CN304 (Page3-40)
S782 AC ONLINE OFF ON
UNSW 12V
SWD 5V
Q754 DTA124EU
Q752,Q753 DTC124ES
Q701,Q706 2SC4081 (RS)
CN706
KS 0
Sa
POWER LED
SWD 5V
GND
CN752
S701 POWER
R769 330
R778 POWER
Q752
R782 10K PICTURE SHARPNESS
R783 20K HEADPHONE LEVEL
R781 10K
AUDIO 11V
From/To 0 3 MAIN (AUDIO) CN305 (Page3-40)
CN751
HEADPHONE LEVEL
AUDIO 11V
HEADPHONE (L)
HEADPHONE (R)
GND
PICTURE SHARPNESS
JA704 HEADPHONE JACK
D778 SLH-34VC3F
Q752 DTC144WS
3 7 SWITCH/JACK
A B C D E F G H
1 2 3 4 5 6

3.32 TIMER/DISPLAY/SWITCH AND SWITCH/JACK CIRCUIT BOARDS

– TIMER/DISPLAY –

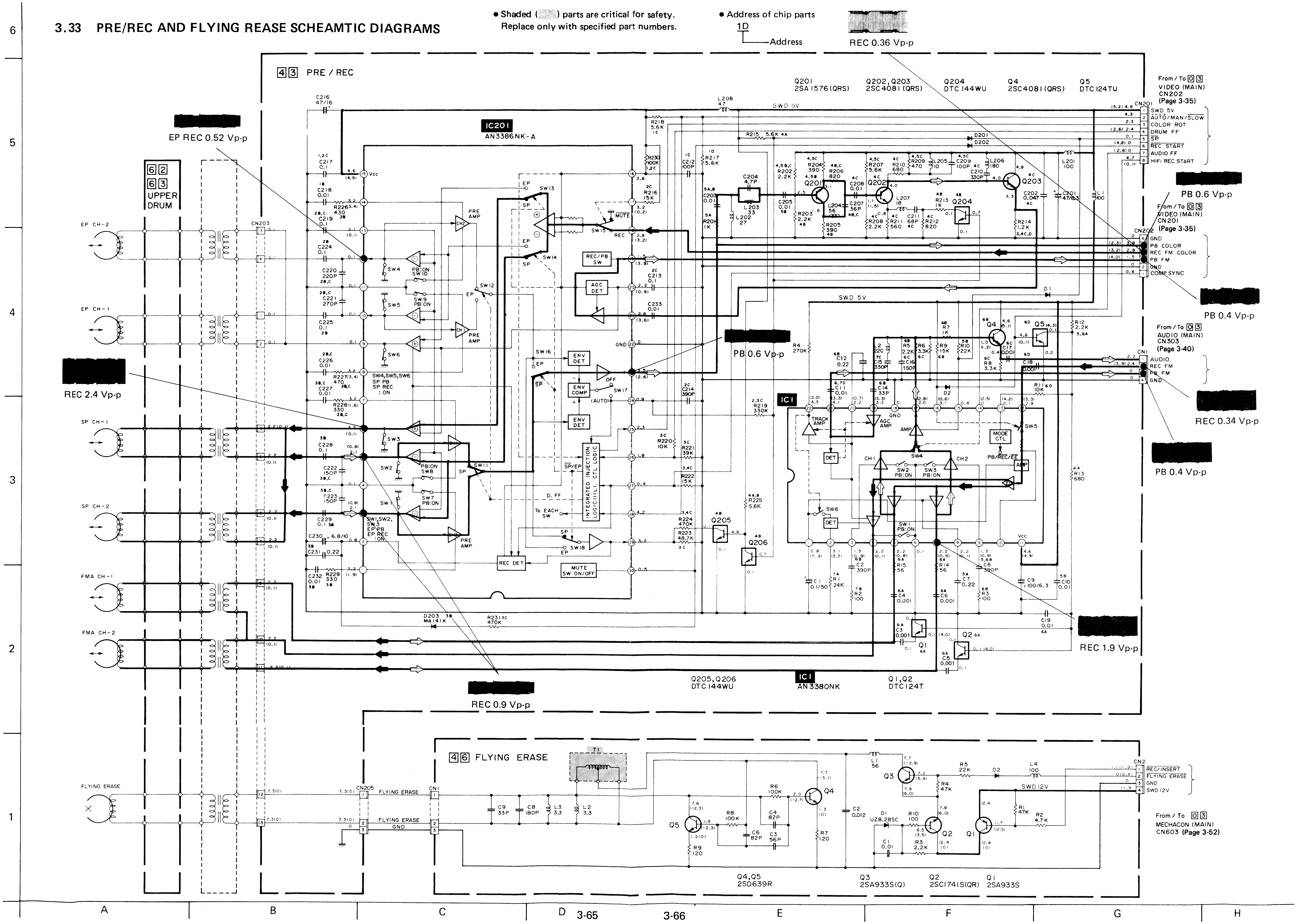

C712
CLOCK
S708 PAUSE/STILL
S707 PLAY
S702 STOP/EJECT
S719 START
S706 REC/ITR
S703 FF
S704 REW
S716 INSERT
S715 A.DUB
S723 SELECT
S729 SET+
S724 TIMER
S730 SET-
S718 MENU
S722 REPEAT /C.MEMORY /ADD
S721 CANCEL
/C.RESET /SKIP
S741
VIDEO FADER
SIML CAST
S720
S732 COUNTER /REMAIN /DATE
S705 TV/ VIDEO
S727 SP/EP
S782 ONLINE
S781
J705 EDIT /PREROLL
J706
J701
J702
J703
J704
CN701
CN702
CN703
CN704
CN705
CN706
IC701
IC702
IC703
IC704
RA702
RA703
X701
D775 SAP
D771 SAP REC
D777 STEREO
D772
DIGITAL AV TRACKING
Q751
PB10447 A2-01
T/D/S PWB ASS'Y
2 1
ON
OFF
A
B
1
2
3
4
5
6
7
8

– SWITCHING –


D778 POWER LED
S701 POWER
B
CN751
CN752
CN753
CN754
CN755
CN756
CN757
PB10447 -01-01
SW/JACK PWB
R779
Q752 E
R781
R782 P.SHARPNESS
R783 H.P.LEVEL
R784
(L)
(R)
JA704 H.P.JACK
JA702 REMOTE PAUSE
JA703 MIC
JA701
(R) (L)
AUDIO
VIDEO
A
3 7 PB10447 A3-01
SW/JACK PWB ASS'Y
1
2
3
4
5
6

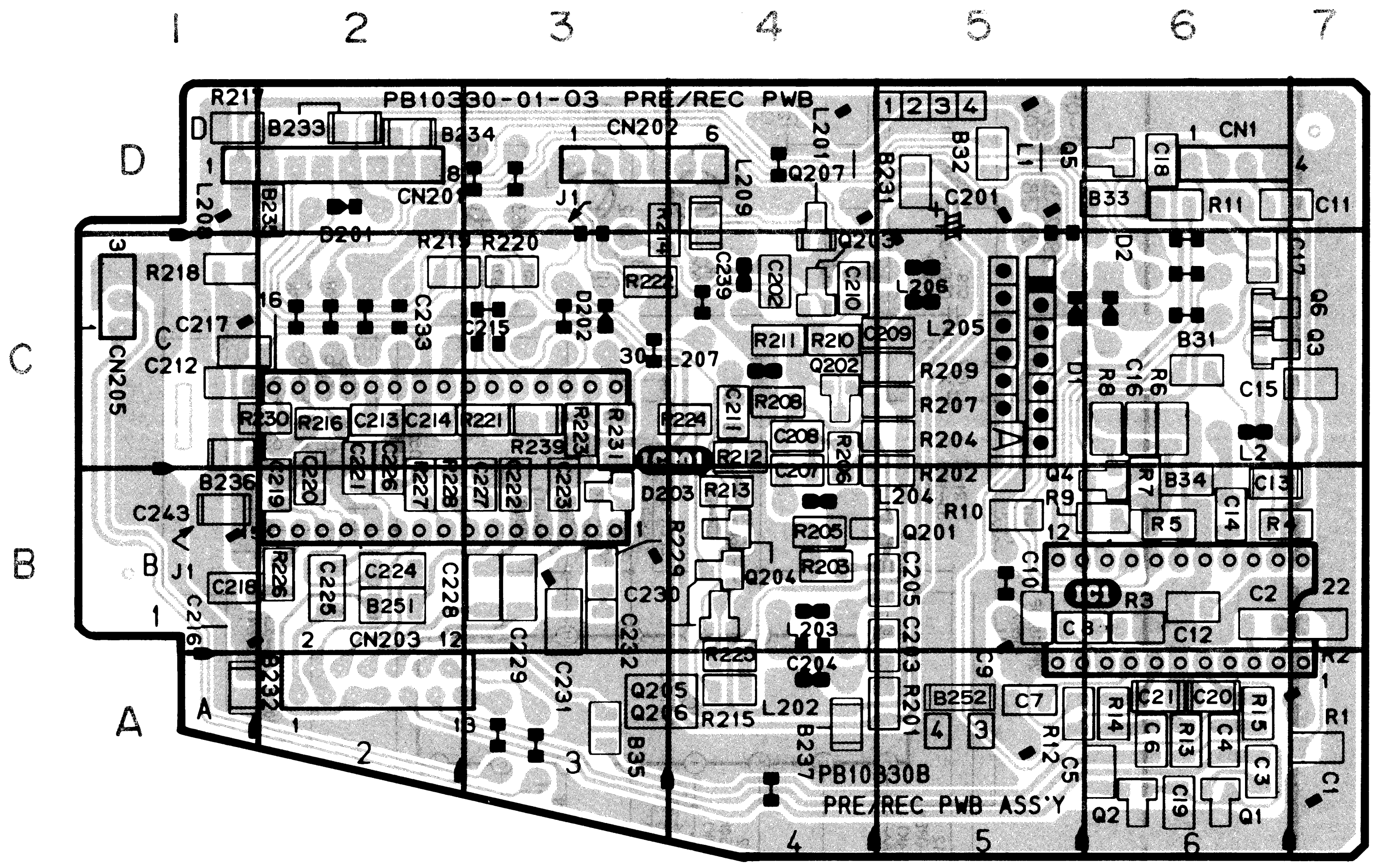
3.33 PRE/REC AND FLYING REASE SCHEAMTIC DIAGRAMS

- Shaded ( ) parts are critical for safety. Replace only with specified part numbers.
- Address of chip parts 1D —Address

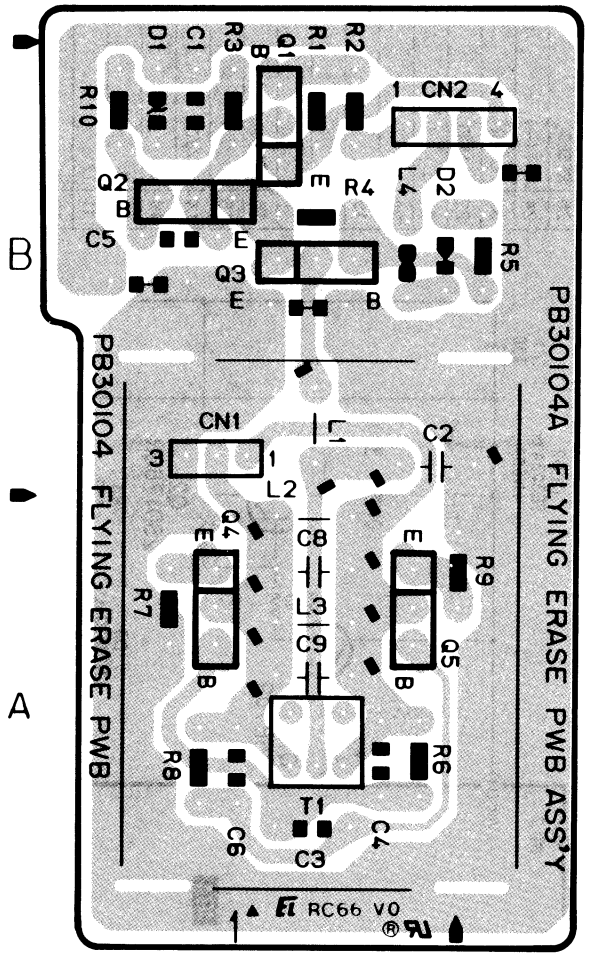

REC 0.36 Vp-p
43 PRE / REC
IC201 AN3386NK-A
EP REC 0.52 Vp-p
62 63 UPPER DRUM
EP CH-2
EP CH-1
SP CH-1
SP CH-2
FMA CH-1
FMA CH-2
FLYING ERASE
CN203
REC 2.4 Vp-p
REC 0.9 Vp-p
Q201 2SA1576(QRS)
Q202,Q203 2SC4081(QRS)
Q204 DTC144WU
Q4 2SC4081(QRS)
Q5 DTC124TU
From/To 03 VIDEO (MAIN) CN202 (Page 3-35)
SWD 5V
AUTO/MAN/SLOW
COLOR ROT
DRUM FF
SP
REC START
AUDIO FF
HIFI REC START
PB 0.6 Vp-p
From/To 03 VIDEO (MAIN) CN201 (Page 3-35)
GND
PB COLOR
REC FM COLOR
PB FM
GND
COMP SYNC
PB 0.4 Vp-p
From/To 03 AUDIO (MAIN) CN303 (Page 3-40)
AUDIO
REC FM
PB FM
GND
REC 0.34 Vp-p
PB 0.4 Vp-p
PB 0.6 Vp-p
REC 1.9 Vp-p
PRE AMP
REC/PB SW
AGC DET
ENV DET
ENV COMP
MUTE
REC DET
MUTE SW ON/OFF
INTEGRATED INJECTION LOGIC (IIL) CTL LOGIC
SW4,SW5,SW6 SP PB SP REC : ON
SW1,SW2,SW3 EP PB EP REC : ON
IC1
TRACK AMP
AGC AMP
MODE CTL
PB/REC/EE
CH1
CH2
Q205,Q206 DTC144WU
IC1 AN3380NK
Q1,Q2 DTC124T
46 FLYING ERASE
T1
CN205
CN1
CN2
REC/INSERT
FLYING ERASE
GND
SWD 12V
From/To 03 MECHACON (MAIN) CN603 (Page 3-52)
Q4,Q5 2SD639R
Q3 2SA933S(Q)
Q2 2SC1741S(QR)
Q1 2SA933S
D1 UZ8.2BSC
A
B
C
D
E
F
G
H
1
2
3
4
5
6

3.34 PRE/REC AND FLYING ERASE CIRCUIT BOARDS

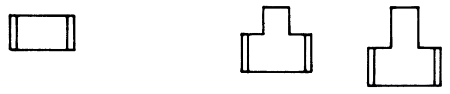
— PRE/REC —


1
2
3
4
5
6
7
D
C
B
A
PB10330-01-03 PRE/REC PWB
PB10330B
PRE/REC PWB ASS'Y
CN201
CN202
CN203
CN205
CN1
IC1
IC201
J1
R217
B233
B234
L208
D201
R219
R220
R218
C217
C212
C233
C215
D202
R222
R214
C239
C202
Q207
L201
L209
B231
Q203
C210
L206
L205
R209
R207
R204
R202
R10
Q201
Q202
Q209
R211
R210
R208
C208
C207
R206
R205
R203
Q204
R213
R212
R224
C211
D203
R229
C230
C232
C231
C229
C228
C224
C225
B251
R226
C216
C218
C243
B236
C219
C220
C221
C226
R227
R228
C227
C222
C223
R230
R216
C213
C214
R221
R223
R231
R239
B232
B235
Q205
Q206
R215
L202
B237
R225
L203
C204
C205
C203
R201
B252
C7
C9
C10
R12
C5
Q2
C19
Q1
Q4
R9
R14
C6
R13
C4
C21
C20
R15
C3
R1
C1
R2
C2
C8
R3
C12
R5
R4
C13
C14
B34
R7
R8
C16
R6
D1
D2
B31
B32
B33
L1
Q5
C18
R11
C11
C17
Q6
Q3
C15
L2
C201
L204
L207
1 2 3 4

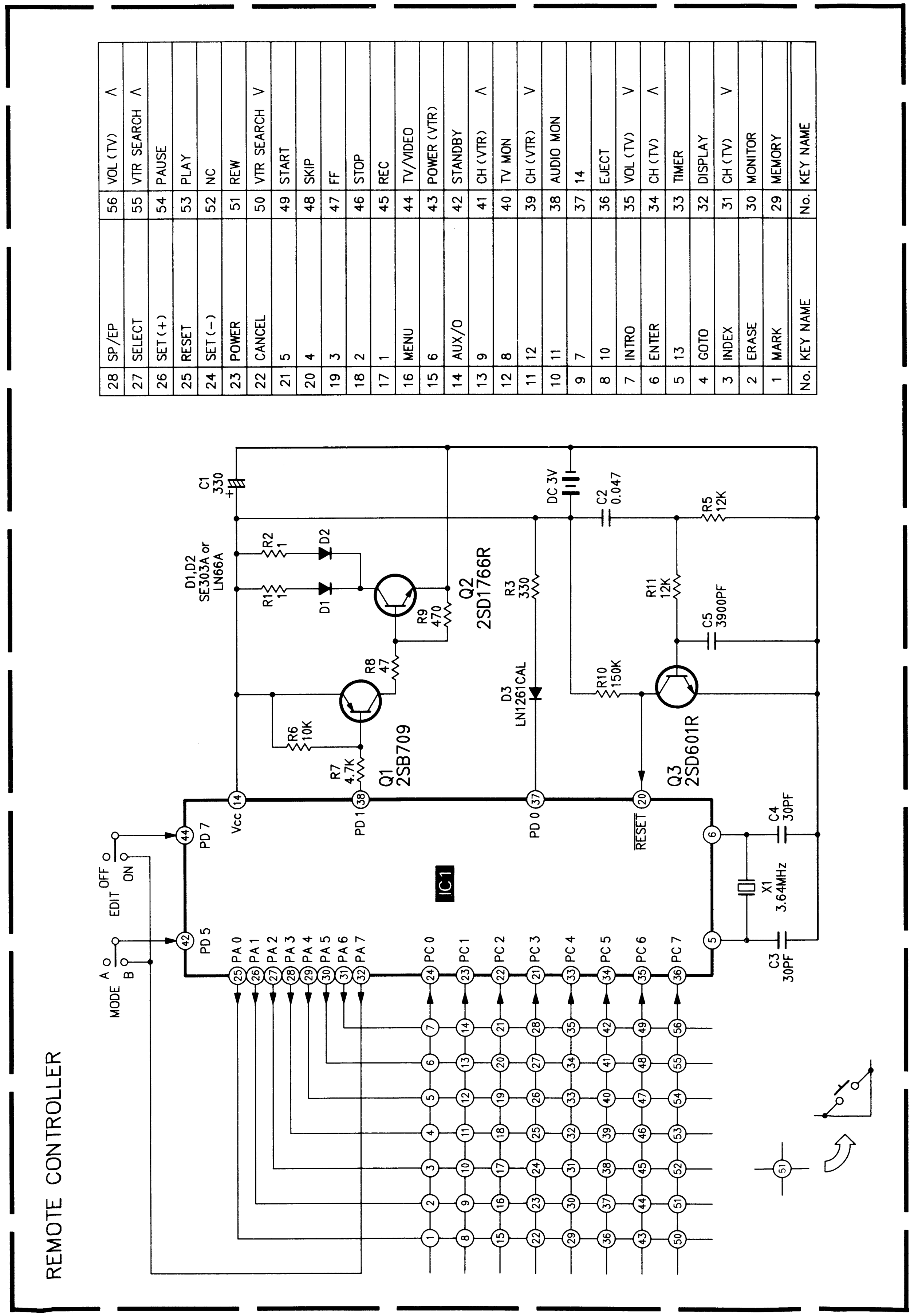
— FLYING ERASE —


B
A
PB30104A FLYING ERASE PWB ASS'Y
PB30104 FLYING ERASE PWB
D1
C1
R3
Q1
R1
R2
R10
CN2
1
4
Q2
C5
E
B
R4
L4
D2
Q3
R5
CN1
3
1
L1
L2
C2
Q4
C8
L3
C9
R7
R9
Q5
R8
T1
R6
C6
C3
C4
RC66 V0

Note: Double edging indicates not used in this model.
Examples; Resistor, Capacitor, Transistor, DIODE



3.35 REMOTE CONTROL SCHEMATIC DIAGRAM

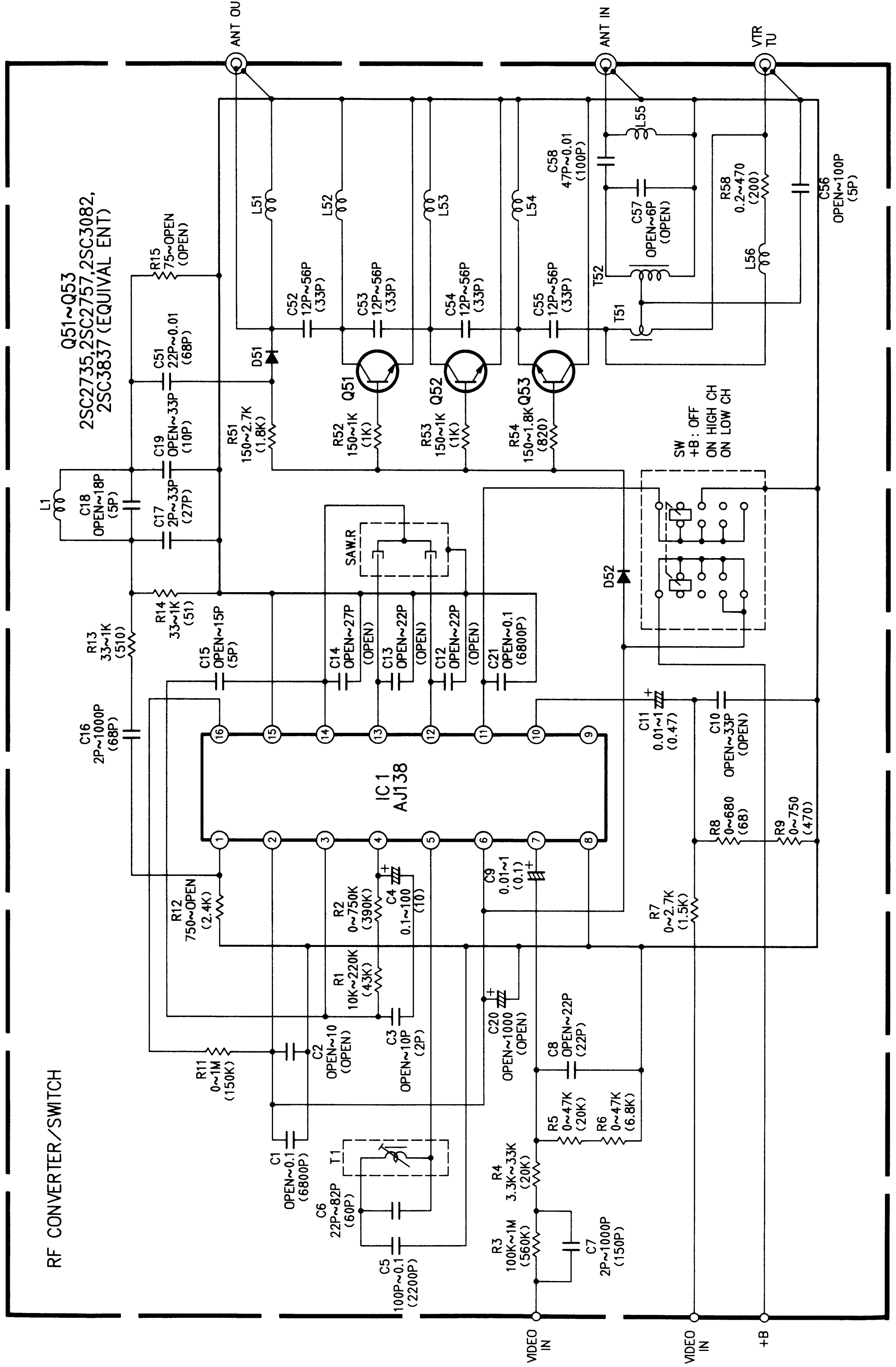

REMOTE CONTROLLER
IC1
Q1 2SB709
Q2 2SD1766R
Q3 2SD601R
D1,D2 SE303A or LN66A
D3 LN1261CAL
X1 3.64MHz
C1 330
C2 0.047
C3 30PF
C4 30PF
C5 3900PF
R1 1
R2 1
R3 330
R5 12K
R6 10K
R7 4.7K
R8 47
R9 470
R10 150K
R11 12K
DC 3V
Vcc
PD 0
PD 1
PD 5
PD 7
RESET
PA 0
PA 1
PA 2
PA 3
PA 4
PA 5
PA 6
PA 7
PC 0
PC 1
PC 2
PC 3
PC 4
PC 5
PC 6
PC 7
MODE
A
B
EDIT
OFF
ON

No.	KEY NAME	No.	KEY NAME
28	SP/EP	56	VOL (TV) ∧
27	SELECT	55	VTR SEARCH ∧
26	SET (+)	54	PAUSE
25	RESET	53	PLAY
24	SET (−)	52	NC
23	POWER	51	REW
22	CANCEL	50	VTR SEARCH ∨
21	5	49	START
20	4	48	SKIP
19	3	47	FF
18	2	46	STOP
17	1	45	REC
16	MENU	44	TV/VIDEO
15	6	43	POWER (VTR)
14	AUX/O	42	STANDBY
13	9	41	CH (VTR) ∧
12	8	40	TV MON
11	12	39	CH (VTR) ∨
10	11	38	AUDIO MON
9	7	37	14
8	10	36	EJECT
7	INTRO	35	VOL (TV) ∨
6	ENTER	34	CH (TV) ∧
5	13	33	TIMER
4	GOTO	32	DISPLAY
3	INDEX	31	CH (TV) ∨
2	ERASE	30	MONITOR
1	MARK	29	MEMORY

3.36 RF CONVERTER/SWITCH SCHEMATIC DIAGRAM

NOTES:

1. All parts shown in this schematic are critical for safety.
2. This schematic is only for reference.
   Avoid replacing individual parts.
   Replace the entire unit only.


RF CONVERTER/SWITCH
ANT OUT
ANT IN
VTR TU
VIDEO IN
VIDEO IN
+B
Q51~Q53 2SC2735,2SC2757,2SC3082, 2SC3837 (EQUIVAL ENT)
IC1 AJ138
SAW.R
SW +B : OFF ON HIGH CH ON LOW CH
D51
D52
Q51
Q52
Q53
L1
L51
L52
L53
L54
L55
L56
T1
T51
T52
C1 OPEN~0.1 (6800P)
C2 OPEN~10 (OPEN)
C3 OPEN~10P (2P)
C4 0.1~100 (10)
C5 100P~0.1 (2200P)
C6 22P~82P (60P)
C7 2P~1000P (150P)
C8 OPEN~22P (22P)
C9 0.01~1 (0.1)
C10 OPEN~33P (OPEN)
C11 0.01~1 (0.47)
C12 OPEN~22P (OPEN)
C13 OPEN~22P (OPEN)
C14 OPEN~27P (OPEN)
C15 OPEN~15P (5P)
C16 2P~1000P (68P)
C17 2P~33P (27P)
C18 OPEN~18P (5P)
C19 OPEN~33P (10P)
C20 OPEN~1000 (OPEN)
C21 OPEN~0.1 (6800P)
C51 22P~0.01 (68P)
C52 12P~56P (33P)
C53 12P~56P (33P)
C54 12P~56P (33P)
C55 12P~56P (33P)
C56 OPEN~100P (5P)
C57 OPEN~6P (OPEN)
C58 47P~0.01 (100P)
R1 10K~220K (43K)
R2 0~750K (390K)
R3 100K~1M (560K)
R4 3.3K~33K (20K)
R5 0~47K (20K)
R6 0~47K (6.8K)
R7 0~2.7K (1.5K)
R8 0~680 (68)
R9 0~750 (470)
R11 0~1M (150K)
R12 750~OPEN (2.4K)
R13 33~1K (510)
R14 33~1K (51)
R15 75~OPEN (OPEN)
R51 150~2.7K (1.8K)
R52 150~1K (1K)
R53 150~1K (1K)
R54 150~1.8K (820)
R58 0.2~470 (200)

SECTION 4
EXPLODED VIEWS AND PARTS LIST

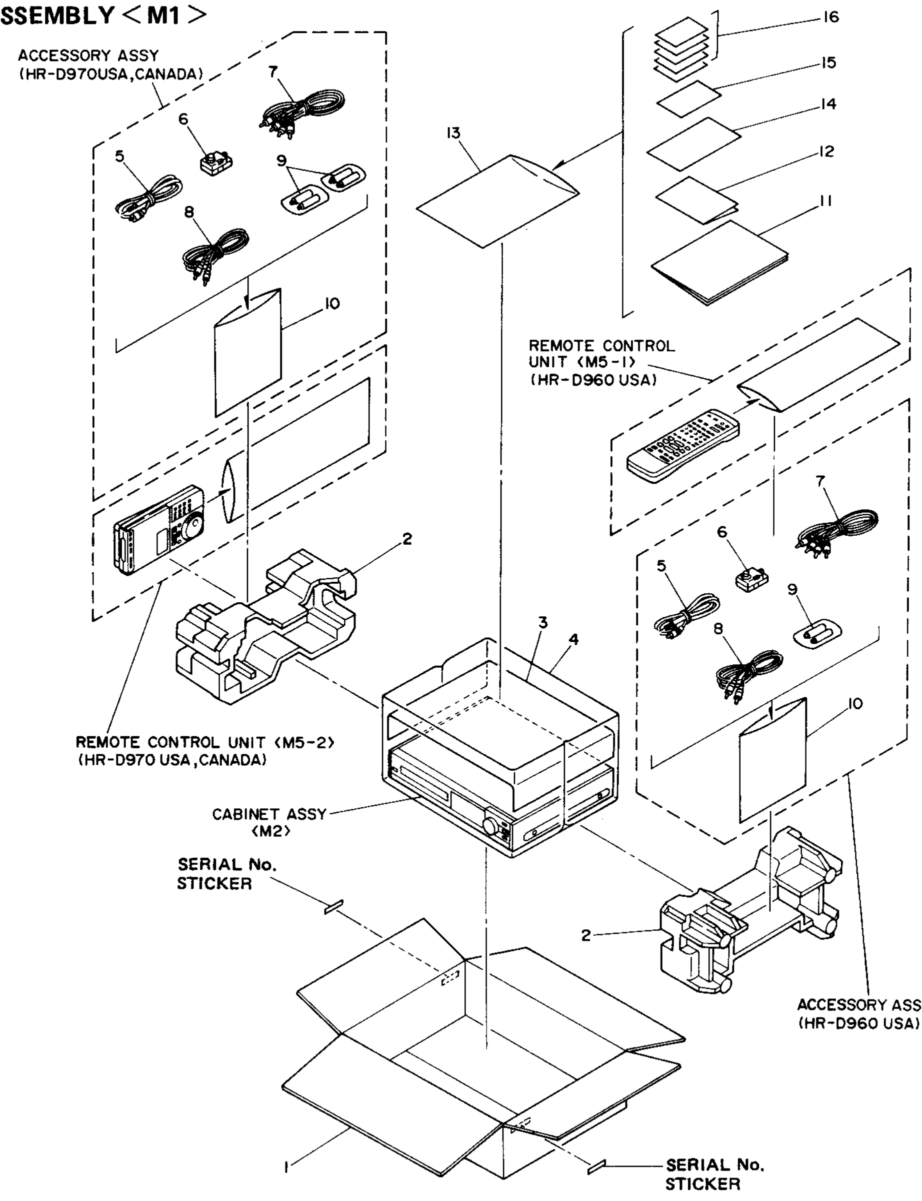
SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers.

NOTE:

[M] indicates mechanical symbol number.

4.1 PACKING ASSEMBLY < M1 >

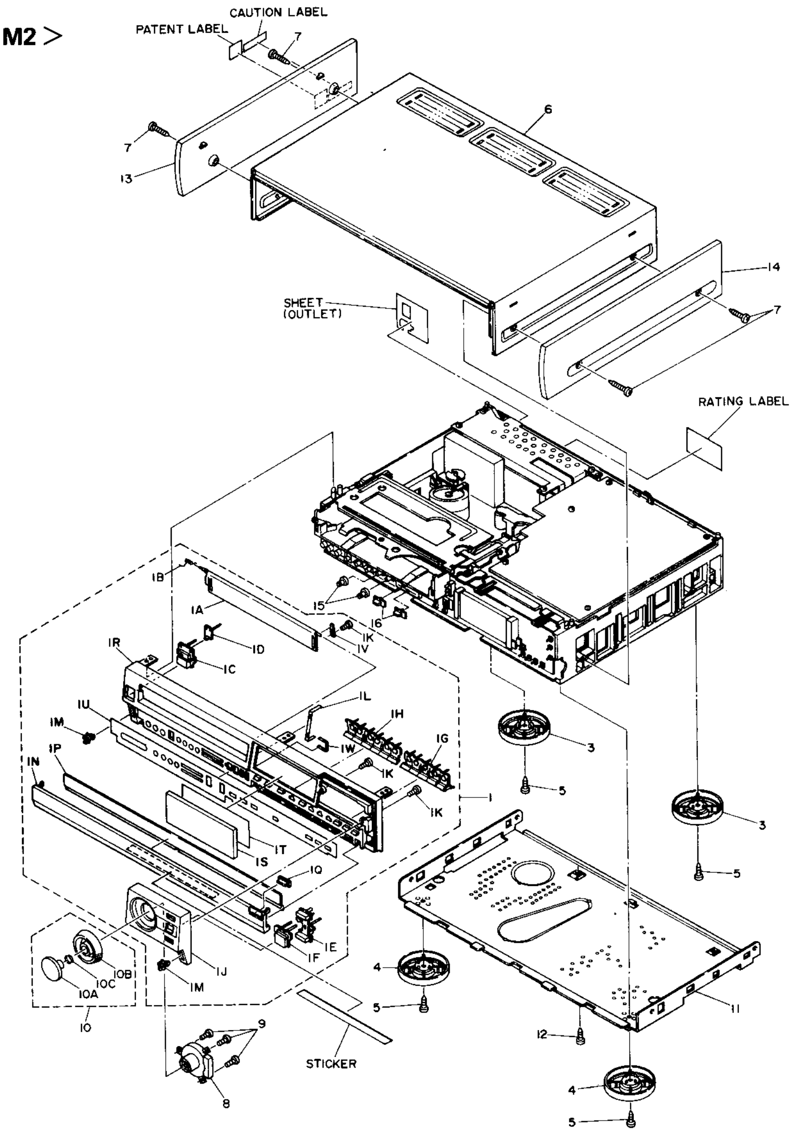

ACCESSORY ASSY
(HR-D970USA,CANADA)
7
6
5
9
8
10
13
16
15
14
12
11
REMOTE CONTROL
UNIT <M5-1>
(HR-D960 USA)
7
6
5
9
8
10
2
3
4
REMOTE CONTROL UNIT <M5-2>
(HR-D970 USA,CANADA)
CABINET ASSY
<M2>
SERIAL No.
STICKER
2
ACCESSORY ASSY
(HR-D960 USA)
1
SERIAL No.
STICKER

****

PACKING ASSEMBLY <M1>

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION
	1	PQ33184-29	PACKING CASE,D970(CANADA)
	1	PQ33184-28	PACKING CASE,D960(USA)
	1	PQ33184-26	PACKING CASE,D970(USA)
	2	PQ33096A-2	CUSHION ASSY,D960(USA)
	2	PQ33152A-2	CUSHION ASSY,D970(USA/CANADA)
	3	PQ41026-24	PROTECT SHEET
	4	PQM30021-59-11	POLY BAG
	5	PU59168-2	RF CABLE
		or PU59167-2	RF CABLE
⚠	6	PU35613-2	MATCHING TRANSFORMER
⚠		or PU59135-2	MATCHING TRANSFORMER
	7	PU56142-3	PIN CORD ASSY
		or PU56142-5	PIN CORD ASSY
	8	PU59205-3	PIN JACK CABLE
		or PU59205-4	PIN JACK CABLE
	9	UM-3DJ2P	BATTERY,X2,(D960 USA),X4(D970 USA,CANADA)
	10	QPGA020-02005	POLY BAG
⚠	11	PU30425-1160	INSTRUCTIONS,D970(CANADA)
⚠	11	PU30425-1159	INSTRUCTIONS,D960(USA)
⚠	11	PU30425-1157	INSTRUCTIONS,D970U(USA)
	12	TCU-3492	TAPE CATALOG
	13	QPGA025-03505	POLY BAG
	14	BT-20071A	INSTRUCTION GUIDE,D970(CANADA)
	14	BT-20046E	TOLL FREE CARD,D960/D970(USA)
	15	BT-20062B	WARRANTY CARD,D960/D970(USA)
	15	BT-20025K	WARRANTY CARD,D970(CANADA)
	16	PQ32875	PROGRAM SHEET,X5,D960(USA)

4.2 CABINET ASSEMBLY < M2 >


CAUTION LABEL
PATENT LABEL
7
6
7
13
14
7
SHEET (OUTLET)
RATING LABEL
1B
1A
15
16
1K
1V
1R
1D
1C
1U
1M
1P
1N
1L
1H
1G
1W
1K
1K
1
3
5
3
5
1T
1S
1Q
1E
1F
1J
1M
10B
10C
10A
10
9
8
STICKER
4
5
12
11
4
5

****

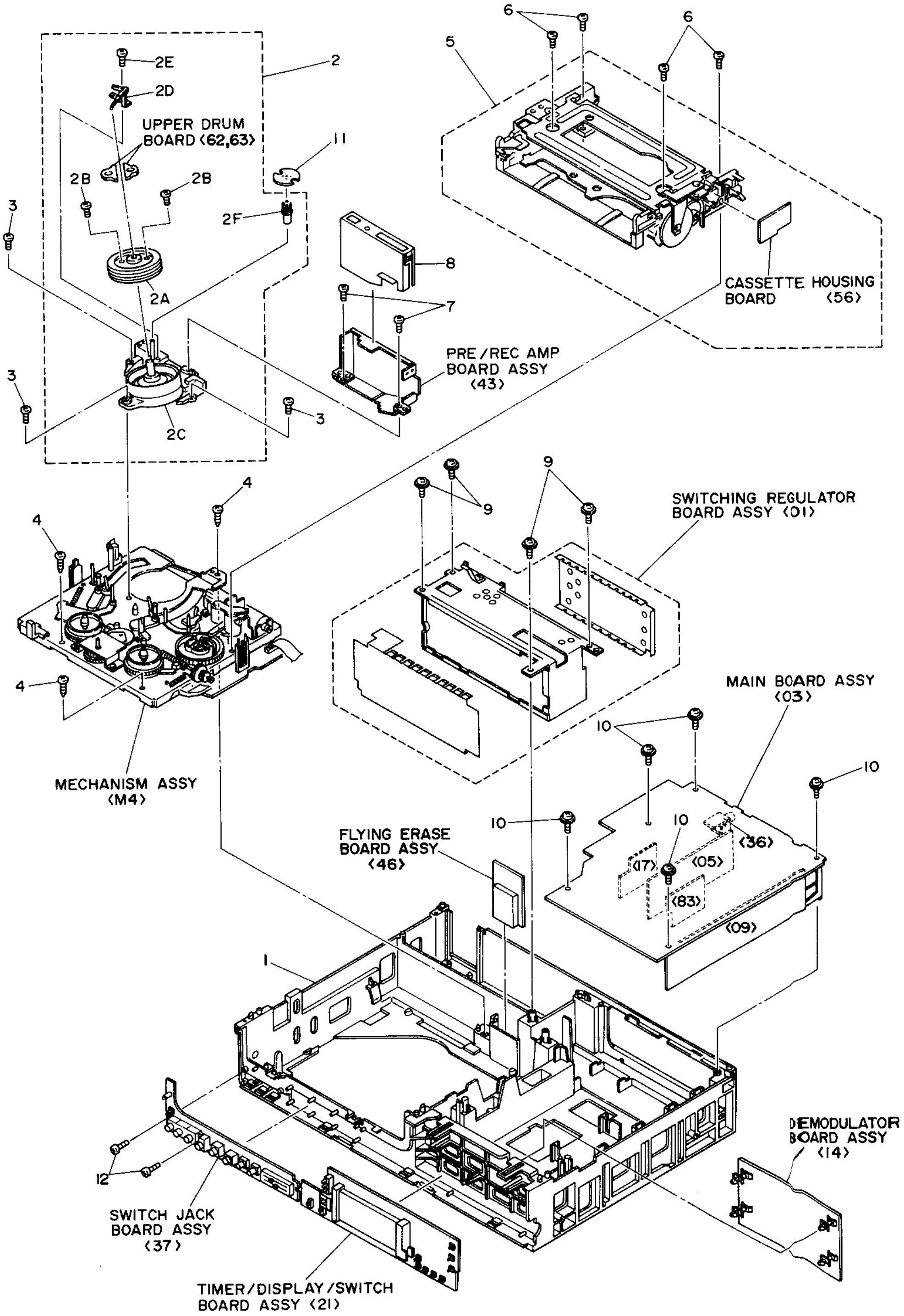
CABINET ASSEMBLY <M2>

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION
1	PQ10874J-13	FRONT PANEL ASSY,D970(CANADA)
1	PQ10874K-15	FRONT PANEL ASSY, D960(USA)
1	PQ10874J-15	FRONT PANEL ASSY,D970(USA)
1A	PQ20858-7	CASSETTE DOOR
1B	PQ43628-1-1	TORSION SPRING
1C	PQ32948-7	BUTTON(POWER)
1D	PQ32955	INDICATOR(POWER)
1E	PQ32951-2	BUTTON(PLAY)
1F	PQ32952-2	BUTTON(PAUSE)
1G	PQ20856-5	BUTTON(1)
1H	PQ20857-7	BUTTON(2)
1J	PQ20853-2	COVER(FRONT)
1K	SDSF2005Z	SCREW,X3
1L	PQ32964	EARTH PLATE
1M	PU60109	CATCHER,X2
1N	PQ10879-9	DOOR, D960(USA)
1N	PQ11030	DOOR, D970(USA)
1N	PQ11030-1-1	DOOR, D970(USA)
1P	PQ21105-1-1	PLATE(DOOR), D970U(USA, CANADA)
1P	PQ20855-8	PLATE(DOOR), D960(USA)
1Q	PQ44775	KNOB(DOOR), D970(USA/CANADA)
⚠ 1R	PQ10875-8-8	FRONT PANEL
1S	PQ32949-1-2	DISPLAY WINDOW
1T	PQ32950-4	FILTER
1U	PQ21098-1-2	PLATE(PROG.)
1V	PQ44389	BRACKET
1W	PQ44563	BRACKET
3	PQ33012B	FOOT ASSY,X2
4	PQ33013-2	FOOT(1), X2
5	SDSF3010Z	SCREW,X4 FOR FOOT
⚠ 6	PQ10877-10	TOP COVER,D960(USA)
⚠ 6	PQ10877-9	TOP COVER,D970(USA/CANADA)
7	PQ43827	SPECIAL SCREW,X4,D960(USA)
7	PQ43930	SPECIAL SCREW,X4,D970(USA/CANAD
8	PEME0757	JOG SHUTTLE ASSY
9	SDSF2608Z	SCREW,X3 FOR JOG SHUTTLE ASSY
10	PQ44273B	KNOB ASS'Y
10A	PQ32953-2	KNOB(SHUTTLE)
10B	PQ32954-2	KNOB(JOG)
10C	PQ44561	RING
⚠ 11	PQ10878	BOTTOM COVER
12	SDSF3010Z	SCREW,FOR BOTTOM COVER
13	PQ10921A	SIDE PANEL(L),D970(USA/CANADA)
14	PQ10922A	SIDE PANEL(R),D970(USA/CANADA)
15	PQ44257	KNOB(VOLUME),X2
16	PQ33137	KNOB(SLIDE),X2

4.3 CHASSIS ASSEMBLY < M3 >

BEWARE OF BOGUS PARTS

Parts that do not meet specifications may cause trouble in regard to safety and performance. We recommend that genuine JVC parts be used.

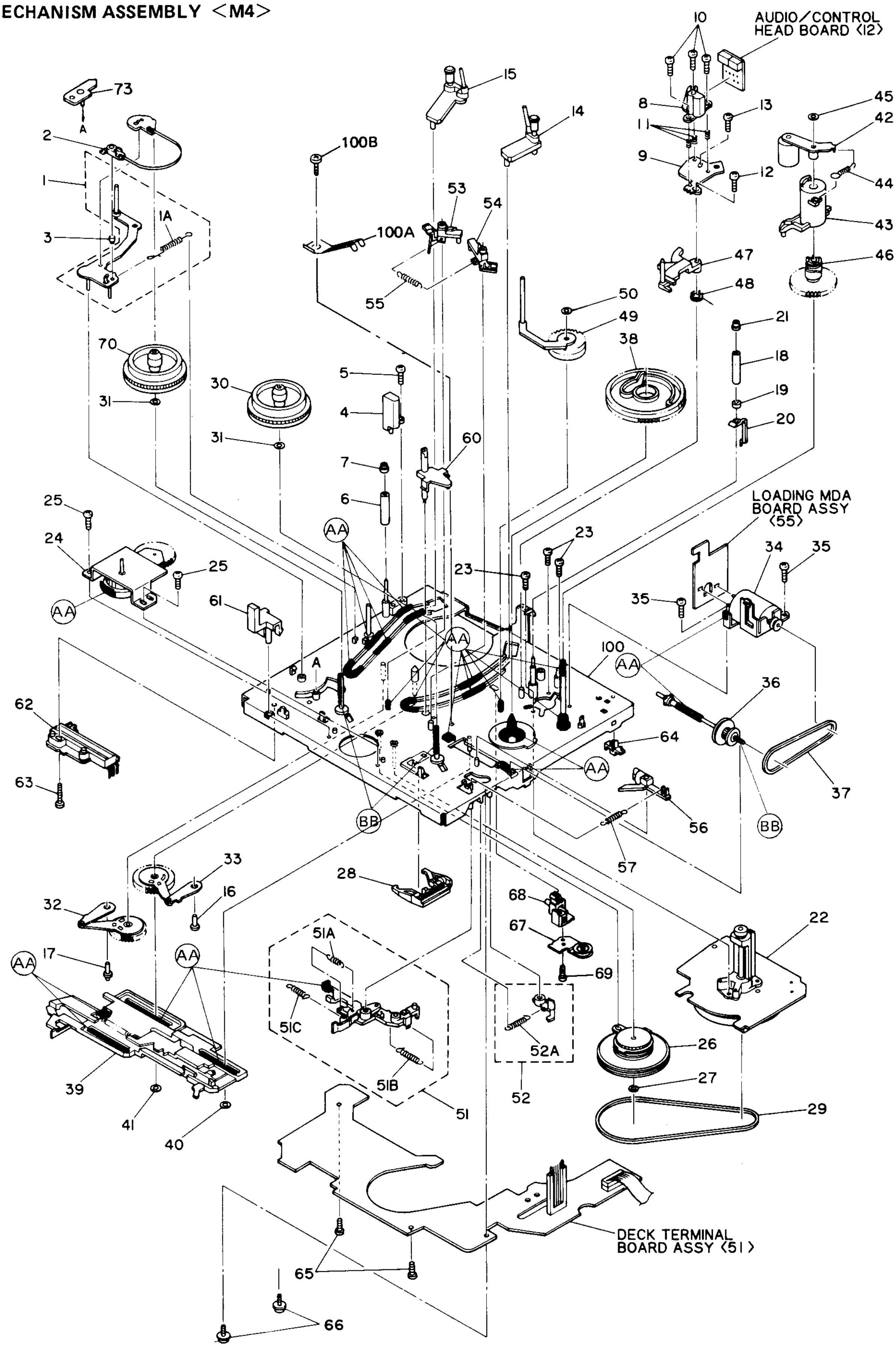

2E
2D
2
UPPER DRUM BOARD <62,63>
11
2B
2B
3
2F
2A
3
3
2C
6
6
5
8
7
PRE/REC AMP BOARD ASSY <43>
CASSETTE HOUSING BOARD <56>
4
4
4
9
9
9
SWITCHING REGULATOR BOARD ASSY <01>
MAIN BOARD ASSY <03>
10
10
10
10
MECHANISM ASSY <M4>
FLYING ERASE BOARD ASSY <46>
<36>
<17>
<05>
<83>
<09>
1
DEMODULATOR BOARD ASSY <14>
12
SWITCH JACK BOARD ASSY <37>
TIMER/DISPLAY/SWITCH BOARD ASSY <21>

****

CHASSIS ASSEMBLY < M3 >

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION
⚠ 1	PQ10876-2-11	BOTTOM CHASSIS
⚠ 2	PDV2201A	DRUM ASSY
2A	PDM2083G-8	UPPER DRUM ASSY
2B	PDM4165A	DRUM SCREW ASSY,X2
2C	PDM2138B	LOWER DRUM MOTOR ASSY
2D	PDM4229A-1	BRUSH ASSY
2E	SDSG2606Z	SCREW
2F	PDM4226A	ROLLER ASSY
3	SPST2610Z	SCREW,X3,FOR DRUM
4	PQ43831	SPECIAL SCREW,X3,FOR MECHANISM
5	PUS29183B-7	CASSETTE HOUSING ASSY
6	SPST2608Z	SCREW,X4,FOR CASSETTE HOUSING
	or SDST2608Z	SCREW,X4,FOR CASSETTE HOUSING
7	SDSG2606Z	SCREW,X2,FOR PRE/REC
8	PQ33002-1-3	SHIELD CASE(2),FOR PRE/REC
9	GPSF2610Z	SCREW,X4,FOR SW REG
10	GPSF2610Z	SCREW,X5,FOR MAIN
11	PQ44230	INERTIA PLATE
12	SDSF2608Z	SCREW, X2

4.4 MECHANISM ASSEMBLY <M4>


10
AUDIO/CONTROL HEAD BOARD <12>
73
A
2
1
1A
3
15
14
100B
100A
53
54
55
8
11
13
9
12
45
42
44
43
46
47
48
50
49
38
21
18
19
20
70
31
30
31
5
4
7
6
60
AA
25
24
25
AA
61
23
23
LOADING MDA BOARD ASSY <55>
34
35
35
100
AA
AA
A
36
37
62
63
64
AA
56
BB
BB
57
33
32
16
28
68
67
69
22
AA
17
AA
51A
51C
52A
52
26
27
29
39
41
40
51B
51
DECK TERMINAL BOARD ASSY <51>
65
66

Category	Part number	MARK
Grease	KANTO-G-31KAV	Ⓐⓐ
Oil	COSMO-HV56	Ⓑⓑ

NOTE: The section marked in Ⓐⓐ and Ⓑⓑ indicate lubrication and greasing areas.

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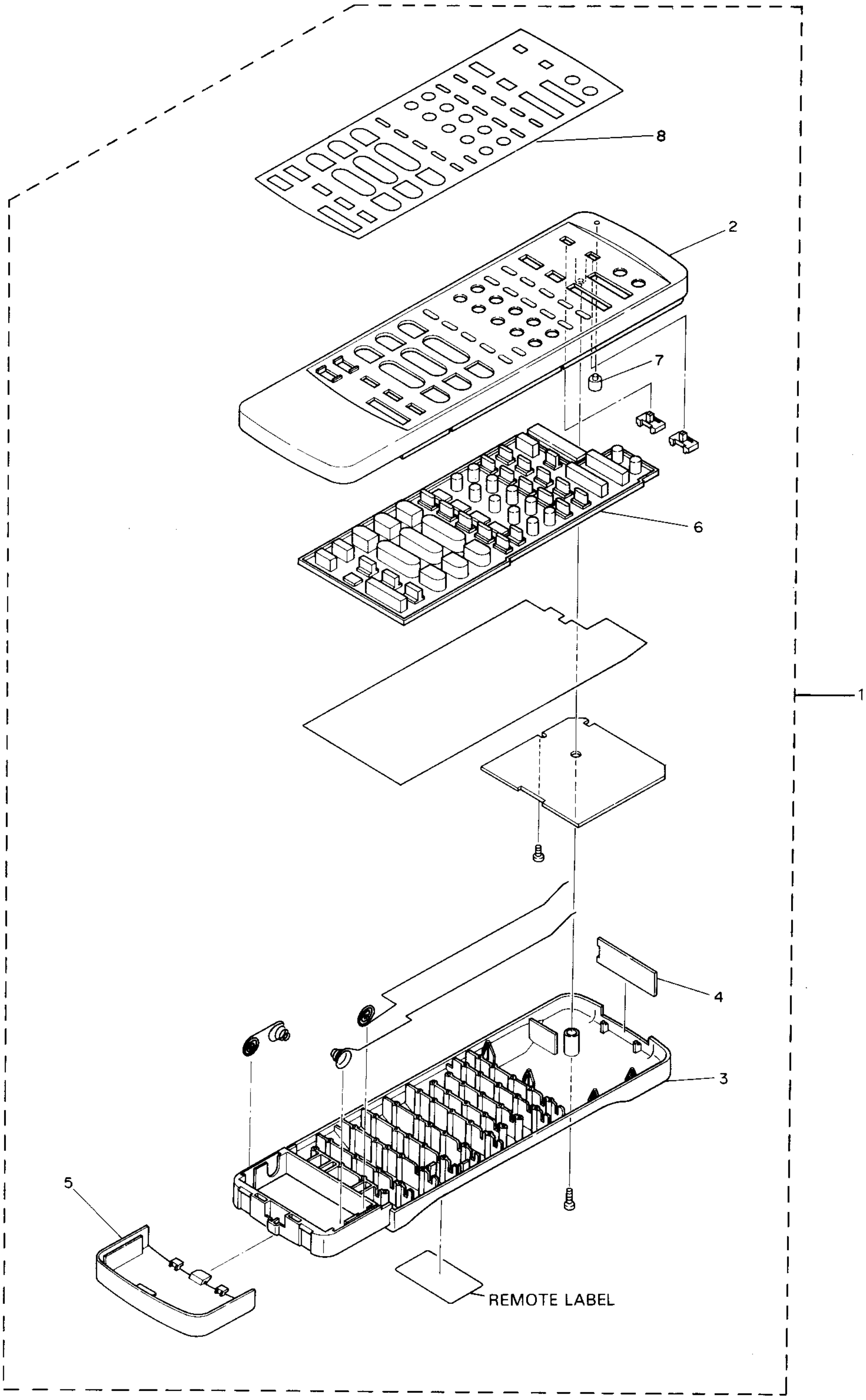
MECHANISM ASSEMBLY <M4>

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION
	1	PQ43497E-8	TENSION ARM ASSY
	1A	PQ43500	TENSION SPRING
	2	PQ43501B	TENSION BAND ASSY
	3	PQ43503-1-4	ADJUST PIN
	4	PU60616	FULL ERASE HEAD
	5	SDSF2614Z	SCREW
	6	PQ43505-1-1	ROLLER
	7	PQ43506	GUIDE POLE CAP
	8	PU60617	AUDIO/CONTROL HEAD
	9	PQ43509	HEAD BASE
	10	PQ43687A	SPECIAL SCREW,X3
	11	PQM30002-192	COMPRESSION SPRING,X3
	12	SPSP2606Z	SCREW
	13	SPSF2608M	SCREW
	14	PU61103-2	POLE BASE ASSY(TU)
	15	PU61151-2	POLE BASE ASSY(SUPPLY)
	16	PQ43524	STOPPER
	17	PQ43525	STOPPER 2
	18	PQ43526-1-3	TAPE GUIDE
	19	PQ43670-1-1	GUIDE FLANGE
	20	PQ43675	TAPE GUARD
	21	PQ43506	GUIDE POLE CAP
⚠	22	PU61003	CAPSTAN MOTOR
	23	SPSG2608Z	SCREW,X3
	24	PU61004-1-3	IDLER GEAR UNIT
	25	SPST2606Z	SCREW,X2
	26	PU61005-1-4	CLUTCH UNIT
	27	PQM30017-8	SLIT WASHER
	28	PQ43532A-1	CHANGE LEVER ASSY
	29	PU61006	TIMING BELT
	30	PU60858	REEL DISK (TAKE-UP)
	31	PQM30018-54	SPACER,X2
	32	PQ43537A	LOADING ARM ASSY (SUPPLY)
	33	PQ43542B	LOADING ARM ASSY (TAKE-UP)
	34	PQ43676B-5	MODE MOTOR ASSY
		or PQ43676C	MODE MOTOR ASSY
	35	SPST2606Z	SCREW,X2
	36	PQ43548A-3	WORM CLUTCH ASSY
	37	PQM30003-23	BELT(LOADING)
	38	PQ20822-2-4	CONTROL CAM
	39	PQ44326A-3	PLATE ASSY
	40	PQM30017-12	SLIT WASHER
	41	PQM30017-8	SLIT WASHER
	42	PQ43921B	PINCH ROLLER ARM ASSY
	43	PQ32415	PINCH ROLLER PRESS LEVER
	44	PQM30001-233	TENSION SPRING
	45	PQM30017-12	SLIT WASHER
	46	PQ32416-2	PINCH ROLLER CAM
	47	PQ43567A-8	GUIDE ARM ASSY
	48	PQ43569-1-3	TORSION SPRING
	49	PQ43570A	HALF LOADING GEAR ASSY
	50	PQM30017-12	SLIT WASHER
	51	PQ43575A-5	C.LEVER ASSY
	51A	PQM30001-273	T.SPRING
	51B	PQM30001-237	TENSION SPRING
	51C	PQM30001-274	T.SPRING
	52	PQ43578A-2	HOOK ASSY
	52A	PQM30001-238	TENSION SPRING
	53	PQ43581A-6	MAIN BRAKE ASSY (SUPPLY)
	54	PQ43582A-2	MAIN BRAKE ASSY (TAKE-UP)
	55	PQM30001-251	TENSION SPRING
	56	PQ43583A	SUB BRAKE ASSY (TAKE-UP)
	57	PQM30001-298	TENSION SPRING
	60	PU60621-1-2	LED HOLDER(INC D1)
	61	PU60624-1-4	REC SAFETY SWITCH(S2)
	62	PU60973	SLIDE SWITCH(S3)
	63	SDSF2614Z	SCREW
	64	PQ32516	PWB HOLDER
	65	SDST2616Z	SCREW,X2
	66	GPSF2608Z	SCREW,X2
	67	PQ43912A-5	PULLEY ARM ASSY
	68	PQ32882	PULLEY BASE
	69	SDSF2608Z	SCREW
	70	PU60859	REEL DISK (SUPPLY)
	73	PQ44246	TENSION BRACKET 3
	100	PQ20650C-18	MAIN DECK ASSY
	100A	PQ43849	EARTH PLATE
	100B	SPST2604Z	SCREW

4.5 REMOTE CONTROL UNIT < M5-1 >
(HR-D960USA)



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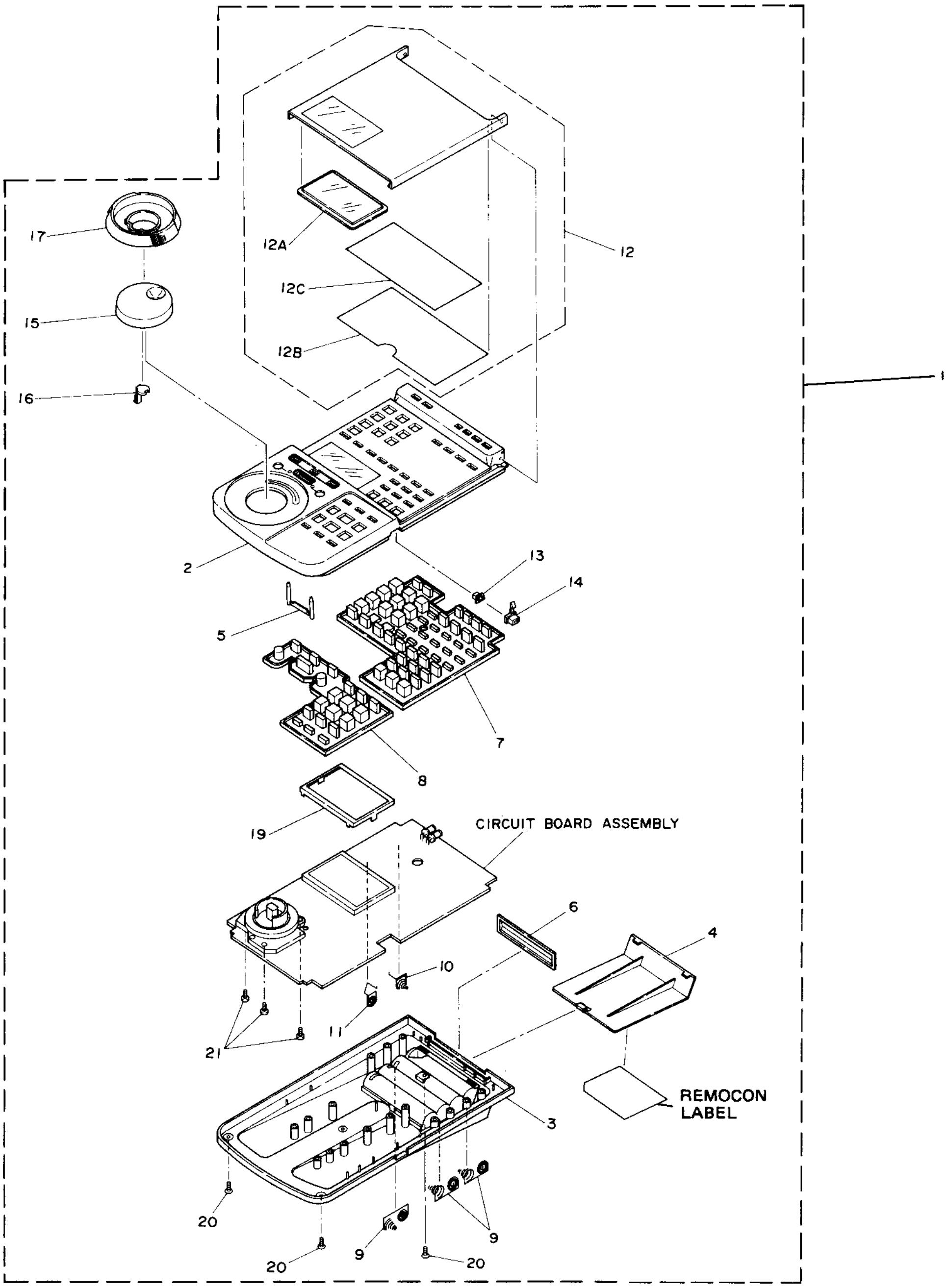
REMOTE CONTROL ASSY < M5 >
< HR-D960USA >

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION
⚠ 1	PQ10956A	REMOTE CONTROLLER,INCL.2-8
2	PQ21049	UPPER CASE
3	PQ21050	LOWER CASE
4	PQ44726	IFR WINDOW
5	PQ33408	CAP(BATTERY)
6	PQ21040	BUTTON(RUBBER)
7	PQ44725	INDICATOR
8	PQ33400	TOP PANEL

4.6 REMOTE CONTROL UNIT < M5-2 > (HR-D970USA, CANADA)


17
12A
12C
12B
12
15
16
1
2
13
14
5
7
8
19
CIRCUIT BOARD ASSEMBLY
6
4
10
11
21
REMOCON LABEL
3
20
9
20
9
20

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REMOTE CONTROL ASSY < M6 > < HR-D970USA, CANADA >

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION
⚠ 1	PQ10842K-10	REMO.CONTROLLER,2-21
2	PQ10843-3	UPPER CASE,
3	PQ10844	LOWER CASE
4	PQ32866	BATTERY CAP
5	PQ43954	INDICATOR
6	PQ32870	IR WINDOW
7	PQ20824-9	BUTTON(1)
8	PQ20829-3	BUTTON(2)
9	PQ43933	TERMINAL(A), X3
10	PQ43934	TERMINAL(B)
11	PQ43935	TERMINAL(C)
12	PQ32871J	DOOR ASSY
12A	PQ43936	LCD WINDOW
12B	PQ32874-3	SHEET(CLEAR)
12C	PQ32875-6	SHEET(PROGRAM)
13	PQ43966	BUTTON(3)
14	PQ43967	BUTTON(OPEN)
15	PQ32906	JOG
16	PQ43969	SPACER(JOG)
17	PQ32907	SHUTTLE
19	PQ43845	HOLDER(LCD)
20	SSSF2008M	SCREW,X3
21	SPSF3008M	SCREW,X3

SECTION 5
ELECTRICAL PARTS LIST

SAFETY PRECAUTION
Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers.

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SWITCHING REGULATOR BOARD ASSEMBLY <01>

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION
PWBA	PB20414E	SW.REG BOARD ASSEMBLY
⚠ Q1	2SC4130	TRANSISTOR
Q2	2SC3616(MLK)	TRANSISTOR
Q3	2SA933S(S)	TRANSISTOR
Q4	2SC1740S(S)	TRANSISTOR
Q5	2SD1468S(RS)	TRANSISTOR
Q6	2SB941P	TRANSISTOR
Q7	2SC1740S(Q)	TRANSISTOR
Q8	2SC1740S	TRANSISTOR
Q9	2SB1425(EU)	TRANSISTOR
Q10	DTB114ES	TRANSISTOR
Q11	2SA720	TRANSISTOR
Q12	2SA933S	TRANSISTOR
	or 2SA1267(YG)	TRANSISTOR
D1	AU01	FR DIODE
D2	AG01	FR DIODE
D4	AU01Z	FR DIODE
	or 1SR153-200-T2	FR DIODE
	or ERA48-02-T	FR DIODE
D7	RD15ES-T1B3	ZENER DIODE
D8	MTZV6.2A	ZENER DIODE
D9	11EFS2	FR DIODE
D10	AU01Z	FR DIODE
	or ERA48-02-T	FR DIODE
	or 1SR153-200-T2	FR DIODE
D11	RL4Z-LFK2	FR DIODE
D12	AU01Z	FR DIODE
	or ERA48-02-T	FR DIODE
	or 1SR153-200-T2	FR DIODE
D13	RK14LF-B2	BARRIER DIODE
	or 21DQ04	BARRIER DIODE
D14	RK14LF-B2	BARRIER DIODE
	or 21DQ04	BARRIER DIODE
D15	RD30ES-T1B1	ZENER DIODE
	or MTZ30AT-77	ZENER DIODE
D16	RD8.2ES-T1B1	ZENER DIODE
D17	UZ5.1BSC	ZENER DIODE
	or RD5.1ES-T1B3	ZENER DIODE
	or MTZV5.1C	ZENER DIODE
D19	1SS133	DIODE
	or MA165	DIODE

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
D20	1SS133	DIODE	
	or MA165	DIODE	
D21	RD6.8ES-T1B1	ZENER DIODE	
	or UZ6.8BSA	ZENER DIODE	
	or MTZ6.8AT-77	ZENER DIODE	
D22	RD15ES-T1B1	ZENER DIODE	
D23	11EFS2	FR DIODE	
D24	1SS133	DIODE	
	or MA165	DIODE	
D25	11ES2	DIODE	
	or ERA15-02	DIODE	
DS1	DF04M	DIODE STACK	
⚠ R1	QRC122K-225E	RESISTOR	2.2MΩ,1/2W
R2	QRM025K-1R0	MP RESISTOR	1Ω,2W
⚠ R3	QRG029J-683A	OMF RESISTOR	68KΩ,2W
R4	QRD161J-683	RESISTOR	68KΩ,1/6W
R5	QRD161J-683	RESISTOR	68KΩ,1/6W
R6	QRD161J-473	RESISTOR	47KΩ,1/6W
⚠ R7	QRG019J-101A	OMF RESISTOR	100Ω,1W
R8	QRD161J-102	RESISTOR	1KΩ,1/6W
R9	QRD161J-122	RESISTOR	1.2KΩ,1/6W
R10	QRX014J-R27	MF RESISTOR	0.27Ω,1W
R11	QRD161J-471	RESISTOR	470Ω,1/6W
R14	QRD161J-471	RESISTOR	470Ω,1/6W
R15	QRD161J-681	RESISTOR	680Ω,1/6W
R16	QRV144F-4750AY	CMF RESISTOR	475Ω,1/4W
R17	QRV144F-4320AY	CMF RESISTOR	432Ω,1/4W
R18	QRD161J-472	RESISTOR	4.7KΩ,1/6W
R19	QRD161J-333	RESISTOR	33KΩ,1/6W
⚠ R20	QRZ0077-101X	FUSIBLE RESISTOR	100Ω
⚠ R21	QRZ0077-470X	FUSIBLE RESISTOR	47Ω
R22	QRD161J-102	RESISTOR	1KΩ,1/6W
R23	QRD161J-103	RESISTOR	10KΩ,1/6W
R24	QRD161J-221	RESISTOR	220Ω,1/6W
R25	QRD161J-471	RESISTOR	470Ω,1/6W
R26	QRD161J-472	RESISTOR	4.7KΩ,1/6W
R27	QRD161J-102	RESISTOR	1KΩ,1/6W
R28	QVZ3518-471AZ	V RESISTOR,SWD 5V ADJ	470Ω
	or QVZ3523-471AZ	V RESISTOR	470Ω
R29	QRD161J-103	RESISTOR	10KΩ,1/6W
R30	QRD161J-103	RESISTOR	10KΩ,1/6W
R32	QRD161J-102	RESISTOR	1KΩ,1/6W
R33	QRD161J-222	RESISTOR	2.2KΩ,1/6W
R34	QRD161J-822	RESISTOR	8.2KΩ,1/6W
R35	QRD161J-102	RESISTOR	1KΩ,1/6W

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION	
⚠	C1	QCZ9016-103P	CAPACITOR	0.01μF
⚠	C2	QFZ9022-333	CAPACITOR	0.033μF
⚠	C3	QCZ9052-222	CAPACITOR	0.0022μF
⚠	C4	QCZ9052-222	CAPACITOR	0.0022μF
⚠	C5	QCZ9052-222	CAPACITOR	0.0022μF
⚠	C6	PU61024-107	E CAPACITOR	100μF
	C7	QCY53AK-472	CAPACITOR	0.0047μF,1000V
⚠	C8	QCZ9016-103P	CAPACITOR	0.01μF
	C9	QED61HM-475	E CAPACITOR	4.7μF,50V
	C10	QFV41HJ-334	TF CAPACITOR	0.33μF,50V
	C11	QFL41HJ-472	MY CAP	0.0047μF,50V
	C12	QFN31HJ-103	M CAPACITOR	0.01μF,50V
	C14	QFV41HJ-104	TF CAPACITOR	0.1μF,50V
	C15	QFL41HJ-103	MY CAP	0.01μF,50V
	C17	QETC1JM-476	E CAPACITOR	47μF,63V
	C18	QETC1HM-476	E CAPACITOR	47μF,50V
⚠	C19	QEZ0137-687	E CAPACITOR	680μF
⚠		or QEZ0105-687	E CAPACITOR	680μF
⚠	C20	QEZ0136-128	E CAPACITOR	1200μF
⚠		or QEZ0106-128	E CAPACITOR	1200μF
	C21	QETC1HM-226	E CAPACITOR	22μF,50V
⚠	C22	QETC1JM-226	E CAPACITOR	22μF,63V
⚠	C23	QETB1CM-108	E CAPACITOR	1000μF,16V
⚠	C24	QEZ0136-158	E CAPACITOR	1500μF
		or QEZ0106-158	E CAPACITOR	1500μF
	C25	QETC1AM-107	E CAPACITOR	100μF,10V
	C26	QFN31HJ-103	M CAPACITOR	0.01μF,50V
	C28	QETC0JM-107	E CAPACITOR	100μF,6.3V
	C29	QETC1CM-107	E CAPACITOR	100μF,16V
	C30	QETC1AM-107	E CAPACITOR	100μF,10V
	C31	QETB1CM-107	E CAPACITOR	100μF,16V
	C32	QETC1CM-107	E CAPACITOR	100μF,16V
	C33	QEZ0156-127Z	E CAPACITOR	120μF
	C34	QETC0JM-107	E CAPACITOR	100μF,6.3V
	C37	QETC1VM-226	E CAPACITOR	22μF,35V
⚠	C38	QEZ0138-477	E CAPACITOR	470μF
⚠		or QEZ0125-477	E CAPACITOR	470μF
⚠	C39	QETB1EM-477	E CAPACITOR	470μF,25V
	C40	QETC1AM-226	E CAPACITOR	22μF,10V
	L1	PU60943-330K	COIL	33μH
		or PELN0270-330K	COIL	
	L2	PU60943-330K	COIL	33μH
		or PELN0270-330K	COIL	
	L3	PU48530-330K	COIL	33μH
	L4	PU60943-330K	COIL	33μH
		or PELN0270-330K	COIL	
⚠	PHS1	PC817	PHOTO COUPLER	
⚠		or PS2501-1	PHOTO COUPLER	
⚠	POC1	QMP14B0-200T	POWER CORD	
⚠		or QMP14B0-200TE	POWER CORD	

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION
⚠	RY1	PU60989	RELAY
⚠		or PU61093	POWER RELAY
⚠		or PESW0534	RELAY
⚠	T1	PELN0229-02	SW TRANS
⚠	AO1	QMC0242-007	AC OUTLET
⚠	BKT1	PQ33007	BRACKET(SW.REG)
	ETH1	PQ43872	EARTH PLATE
⚠	ETH2	PQ44613	EARTH PLATE
⚠	HD1	QHS3771-108	STRAIN RELIEF
⚠	HD2	PU57505	FUSE CLIP,X2
⚠	HS1	PQ44026-1-1	HEAT SINK
⚠	LF1	PU59707	LINE FILTER
⚠		or PELN0255	LINE FILTER
	SCW1	SDST2605Z	SCREW,X3
	SCW2	SDSG3008Z	SCREW
	SCW3	SDSG3006Z	SCREW
	SLD1	PQ20893	SHIELD CASE(1)
	SLD2	PQ33004	SHIELD CASE(2)
	SLD3	PQ33005	SHIELD CASE(3)
	SLD4	PQ33006	SHIELD CASE(4)
	SPC1	PQM30029-141	SPACER
	TP1	PU55774	TEST PIN,X3(TP1-3)
	CN1	PU59555-110	CAP HOUSING
	CN2	PU60910-111	CAP HOUSING

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
⚠ CP1	ICP-N10	CIRCUIT PROTECTOR	
⚠ CP2	ICP-N20	CIRCUIT PROTECTOR	
⚠ F1	QMF51N2-R70J1	FUSE	T700mA,AC250V

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MAIN BOARD ASSEMBLY <03>

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
PWBA	PB10447A-01	MAIN BOARD ASSY	
PWBA1	PB10447A1	MAIN BOARD ASSY	
⚠ RF1	PU60508S	RF CONVERTER/SWITCH	
ETH1	PQ43754-1-2	EARTH PLATE	
JA2	PU61149-3	PIN JACK	
JA3	PU61150	PIN JACK(SW)	
JA4	PU61149	PIN JACK	
JA5	PU61149	PIN JACK	
JA6	PU60612	EARPHONE JACK	
	or PU61012	MINI JACK	
JA7	PU61012	MINI JACK	
SCW1	SDST2605Z	SCREW	
SPC1	PQM30018-60	SPACER	
SPC2	PU60010-2	SPACER,X2	
⚠ TB1	PQ10888-10	TERMINAL BOARD	
TP	PEMC0726-030C	TEST PIN,X22	
	or PEMC0727	TEST PIN	

— TUNER/IF SECTION —

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
IC1	M51365SP	IC	
Q2	2SC3354	TRANSISTOR	
Q3	2SC1317(RS)	TRANSISTOR	
Q4	2SA933S(S)	TRANSISTOR	
Q5	2SA1532(C)	TRANSISTOR	
Q6	2SC3354	TRANSISTOR	
Q11	2SC4081(S)	TRANSISTOR	
Q12	XN2401	TRANSISTOR	
Q14	XN1501	TRANSISTOR	
Q15	DTA123EU	TRANSISTOR	
Q16	2SC4081(S)	TRANSISTOR	
D1	MTZ10B	ZENER DIODE	
R1	QRSA08J-750YN	RESISTOR	75Ω,1/10W
R3	QRD161J-181	RESISTOR	180Ω,1/6W
R4	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
R5	QRSA08J-220YN	RESISTOR	22Ω,1/10W
R6	QRSA08J-122YN	RESISTOR	1.2KΩ,1/10W
R7	QRSA08J-391YN	RESISTOR	390Ω,1/10W
R8	QRSA08J-101YN	RESISTOR	100Ω,1/10W
R9	QRSA08J-330YN	RESISTOR	33Ω,1/10W
R14	QRSA08J-101YN	RESISTOR	100Ω,1/10W
R15	QRSA08J-271YN	RESISTOR	270Ω,1/10W
R16	QRSA08J-182YN	RESISTOR	1.8KΩ,1/10W
R17	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
R18	QRSA08J-332YN	RESISTOR	3.3KΩ,1/10W
R19	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
R20	QRSA08J-392YN	RESISTOR	3.9KΩ,1/10W
R21	QVZ3523-102AZ	V RESISTOR,RF AGC	1KΩ
R22	QRSA08J-824YN	RESISTOR	820KΩ,1/10W
R23	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
R24	QRSA08J-102	RESISTOR	1KΩ,1/10W
R25	QRSA08J-821YN	RESISTOR	820Ω,1/10W
R26	QRSA08J-104	RESISTOR	100KΩ,1/10W
R28	QRSA08J-184YN	RESISTOR	180KΩ,1/10W
R31	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
R33	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R34	QRSA08J-471YN	RESISTOR	470Ω,1/10W
R35	QRSA08J-561YN	RESISTOR	560Ω,1/10W
R36	QRSA08J-561YN	RESISTOR	560Ω,1/10W
R37	QRSA08J-301YN	RESISTOR	300Ω,1/10W
R38	QRSA08J-272YN	RESISTOR	2.7KΩ,1/10W
R39	QRSA08J-152	RESISTOR	1.5KΩ,1/10W
R40	QVZ3523-682AZ	V RESISTOR,COLOR LEVEL	6.8KΩ
R45	QRSA08J-823YN	RESISTOR	82KΩ,1/10W
R47	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
R51	QRSA08J-152	RESISTOR	1.5KΩ,1/10W
R57	QRD161J-562	RESISTOR	5.6KΩ,1/6W
R61	QRD161J-181	RESISTOR	180Ω,1/6W
R62	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R63	QRSA08J-152	RESISTOR	1.5KΩ,1/10W
R64	QRSA08J-152	RESISTOR	1.5KΩ,1/10W
R66	QRSA08J-391YN	RESISTOR	390Ω,1/10W
R67	QRSA08J-101YN	RESISTOR	100Ω,1/10W
R68	QRSA08J-330YN	RESISTOR	33Ω,1/10W
R72	QRSA08J-331YN	RESISTOR	330Ω,1/10W
R73	QRSA08J-104	RESISTOR	100KΩ,1/10W

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION	
	R74	QRSA08J-223YN	RESISTOR	22KΩ,1/10W
	R75	QRSA08J-682	RESISTOR	6.8KΩ,1/10W
	R76	QRSA08J-682	RESISTOR	6.8KΩ,1/10W
	R77	QRSA08J-181YN	RESISTOR	180Ω,1/10W
	R78	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R80	QRSA08J-182YN	RESISTOR	1.8KΩ,1/10W
	R81	QRSA08J-154YN	RESISTOR	150KΩ,1/10W
	R82	QRSA08J-563YN	RESISTOR	56KΩ,1/10W
	R83	QRSA08J-184YN	RESISTOR	180KΩ,1/10W
	R84	QRSA08J-4R7YN	RESISTOR	4.7Ω,1/10W
	R85	QRSA08J-123YN	RESISTOR	12KΩ,1/10W
	R86	QRSA08J-822YN	RESISTOR	8.2KΩ,1/10W
	C5	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C6	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C7	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C8	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C10	QEK61CM-336	E CAPACITOR	33μF,16V
	C13	QCYA1HK-222	CAPACITOR	0.0022μF,50V
	C14	PU57601-474ME	E CAPACITOR	0.47μF
	C15	QEK61CM-336	E CAPACITOR	33μF,16V
	C16	QCYA1HK-222	CAPACITOR	0.0022μF,50V
	C17	QCYA1HK-473	CAPACITOR	0.047μF,50V
	C18	QFV71HJ-104	TF CAPACITOR	0.1μF,50V
	C19	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C20	QCYA1HK-222	CAPACITOR	0.0022μF,50V
	C21	QCTA1CH-101	CAPACITOR	100PF,16V
	C24	QEK61HM-105	E CAPACITOR	1μF,50V
	C25	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C26	QFN31HJ-123	M CAPACITOR	0.012μF,50V
	C27	QETC1HM-474	E CAPACITOR	0.47μF,50V
	C28	QCTA1CH-100	CAPACITOR	10PF,16V
	C29	QCTA1CH-150	CAPACITOR	15PF,16V
	C30	QCYA1HK-223	CAPACITOR	0.022μF,50V
	C31	QETC1CM-476	E CAPACITOR	47μF,16V
	C32	QEK61CM-336	E CAPACITOR	33μF,16V
	C41	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C42	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C45	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C46	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C48	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C51	QETC1HM-335	E CAPACITOR	3.3μF,50V
	C53	QCYA1HK-332	CAPACITOR	0.0033μF,50V
	C54	QETC1CM-476	E CAPACITOR	47μF,16V
	L1	PU60025-1R3	COIL	1.3μH
	L2	PU60025-1R1	COIL	1.1μH
	L3	PU60025-R33S	COIL	0.33μH
	L4	PU59152-180J	COIL	18μH
	L5	PU59152-560J	COIL	56μH
	L6	PU59152-470J	COIL	47μH

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION	
⚠	CF1	PU60774	CERAMIC FILTER	
	CF3	PU61039-Z	CERAMIC FILTER	
	SAW1	PEVB0336	SAW FILTER	
	SAW2	PU60765-4	SAW FILTER	
	T2	PU60027-01-01S	IF.TRANSFORMER,VCO	
	T3	PU60028S	IF.TRANSFORMER,AFC	
	T4	PU60104S	IF.TRANSFORMER,FM DET	
	T8	PU60264S	COIL	
			— TUNER/CTL SECTION —	
⚠	TNR101	PU36512-2	TUNER	
	Q101	2SD1450S,T	TRANSISTOR	
	D101	E-452-2-T2	DIODE	
	D102	HZ30-2L	ZENER DIODE	
	R102	QRSA08J-123YN	RESISTOR	12KΩ,1/10W
	R105	QRSA08J-104	RESISTOR	100KΩ,1/10W
	R113	QRSA08J-271YN	RESISTOR	270Ω,1/10W
	R118	QRSA08J-102	RESISTOR	1KΩ,1/10W
	C102	QETC1HM-106	E CAPACITOR	10μF,50V
	C105	QETC1HM-105	E CAPACITOR	1μF,50V
	C109	QETC1CM-336	E CAPACITOR	33μF,16V
	C110	QCYA1HK-103	CAPACITOR	0.01μF,50V
	C111	QETC1CM-336	E CAPACITOR	33μF,16V
	C131	QETC1CM-336	E CAPACITOR	33μF,16V
	C132	QCYA1HK-222	CAPACITOR	0.0022μF,50V
	WR1	PW30402-BB06M	COAXIAL ASS′Y	
			— VIDEO SECTION —	
	IC201	BX7534C	IC	
		or BX7534D	IC	
	Q201	2SA1577(PQR)	TRANSISTOR	
	Q202	2SA1576(QRS)	TRANSISTOR	
	Q203	2SC4081(QRS)	TRANSISTOR	
	Q204	2SC4081(QRS)	TRANSISTOR	
	Q205	2SC4081(QRS)	TRANSISTOR	
	Q206	2SA1576(QRS)	TRANSISTOR	

#△ REF No.	PART No.	PART NAME, DESCRIPTION	
D201	MA29W(A)	DIODE	
D202	1SS133	DIODE	
	or MA165	DIODE	
D203	1SS133	DIODE	
	or MA165	DIODE	
D204	1SS133	DIODE	
	or MA165	DIODE	
D205	1SS133	DIODE	
	or MA165	DIODE	
D206	1SS133	DIODE	
	or MA165	DIODE	
D207	1SS133	DIODE	
	or MA165	DIODE	
R201	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
R202	QRSA08J-273YN	RESISTOR	27KΩ,1/10W
R203	QRSA08J-273YN	RESISTOR	27KΩ,1/10W
R204	QRSA08J-392YN	RESISTOR	3.9KΩ,1/10W
R205	QRD123J-391SX	RESISTOR	390Ω,1/2W
R206	QRSA08J-123YN	RESISTOR	12KΩ,1/10W
R207	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R208	QRSA08J-471YN	RESISTOR	470Ω,1/10W
R209	QRSA08J-750YN	RESISTOR	75Ω,1/10W
R210	QVZ3518-102AZ	V RESISTOR,SP REC COLOR	1KΩ
R211	QRSA08J-750YN	RESISTOR	75Ω,1/10W
R212	QRSA08J-681YN	RESISTOR	680Ω,1/10W
R213	QRSA08J-750YN	RESISTOR	75Ω,1/10W
R214	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R215	QRSA08J-682	RESISTOR	6.8KΩ,1/10W
R216	QRSA08J-102	RESISTOR	1KΩ,1/10W
R217	QRSA08J-123YN	RESISTOR	12KΩ,1/10W
R218	QRSA08J-273YN	RESISTOR	27KΩ,1/10W
R219	QRSA08J-332YN	RESISTOR	3.3KΩ,1/10W
R221	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
R222	QRSA08J-152	RESISTOR	1.5KΩ,1/10W
R223	QRSA08J-681YN	RESISTOR	680Ω,1/10W
R224	QRSA08J-822YN	RESISTOR	8.2KΩ,1/10W
R228	QVZ3518-102AZ	V RESISTOR,EP REC COLOR	1KΩ
R233	QRSA08J-102	RESISTOR	1KΩ,1/10W
R237	QRSA08J-101YN	RESISTOR	100Ω,1/10W
R239	QRSA08J-471YN	RESISTOR	470Ω,1/10W
R242	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
R244	QRSA08J-101YN	RESISTOR	100Ω,1/10W
C201	QETC0JM-476	E CAPACITOR	47μF,6.3V
C202	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C203	QETC0JM-476	E CAPACITOR	47μF,6.3V
C204	QETC1EM-475	E CAPACITOR	4.7μF,25V
C205	QETC1CM-336	E CAPACITOR	33μF,16V
C206	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C207	QETB0JM-108	E CAPACITOR	1000μF,6.3V
C208	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C209	QEK60JM-476	E CAPACITOR	47μF,6.3V
C210	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C211	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C212	QCFA1HZ-103	CAPACITOR	0.01μF,50V

#△ REF No.	PART No.	PART NAME, DESCRIPTION	
C213	QCYA1HK-102	CAPACITOR	0.001μF,50V
C214	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C228	QCSA1HJ-430	CAPACITOR	43PF,50V
L201	PU59152-151J	COIL	150μH
L202	PU48530-101K	COIL	100μH
L203	PU48530-101K	COIL	100μH
CN201	PU58844-6	CAP HOUSING	
CN202	PU59555-8	CAP HOUSING	
CN203	PU58844-4	CAP HOUSING	

— AUDIO SECTION —

#△ REF No.	PART No.	PART NAME, DESCRIPTION	
D301	HZ2BLL	ZENER DIODE	
R301	QRSA08J-102	RESISTOR	1KΩ,1/10W
R302	QRSA08J-102	RESISTOR	1KΩ,1/10W
R303	QRSA08J-102	RESISTOR	1KΩ,1/10W
R304	QRSA08J-102	RESISTOR	1KΩ,1/10W
R305	QVZ3518-472AZ	V RESISTOR,IND(R)	4.7KΩ
R306	QVZ3518-472AZ	V RESISTOR,IND(L)	4.7KΩ
R307	QVZ3518-473AZ	V RESISTOR,BIAS ADJ	47KΩ
R308	QRSA08J-100YN	RESISTOR	10Ω,1/10W
R309	QVZ3518-102AZ	V RESISTOR,PB LEVEL	1KΩ
R310	QVZ3518-223AZ	V RESISTOR,EE LEVEL(L)	22KΩ
R311	QVZ3518-223AZ	V RESISTOR,EE LEVEL(R)	22KΩ
R312	QRSA08J-473	RESISTOR	47KΩ,1/10W
R313	QRSA08J-473	RESISTOR	47KΩ,1/10W
R314	QRSA08J-101YN	RESISTOR	100Ω,1/10W
R315	QRSA08J-101YN	RESISTOR	100Ω,1/10W
R316	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R317	QRSA08J-102	RESISTOR	1KΩ,1/10W
R318	QRSA08J-102	RESISTOR	1KΩ,1/10W
C301	QEK61HM-105	E CAPACITOR	1μF,50V
C302	QEK61HM-105	E CAPACITOR	1μF,50V
CN301	PU58844-2	CAP HOUSING	
CN302	PU58844-4	CAP HOUSING	
CN303	PU58844-4	CAP HOUSING	
CN304	PU58844-2	CAP HOUSING	
CN305	PU59555-6	CAP HOUSING	
CN306	PU59555-5	CAP HOUSING	
CN307	PU58844-3	CAP HOUSING	
CN308	PU58844-6	CAP HOUSING	
△ CP301	ICP-N10	CP	

— SERVO SECTION —

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION	
	IC401	HD49733NT	IC	
		or HD49733ANT	IC	
	Q401	2SA1576(QRS)	TRANSISTOR	
	Q402	DTA124EU	TRANSISTOR	
	D402	1SS133	DIODE	
		or MA165	DIODE	
	D403	1SS133	DIODE	
		or MA165	DIODE	
	D404	1SS133	DIODE	
		or MA165	DIODE	
	D405	1SS133	DIODE	
		or MA165	DIODE	
	D406	1SS133	DIODE	
		or MA165	DIODE	
	D407	1SS133	DIODE	
		or MA165	DIODE	
	D408	1SS133	DIODE	
		or MA165	DIODE	
	D411	1SS133	DIODE	
		or MA165	DIODE	
	D412	1SS133	DIODE	
		or MA165	DIODE	
	R401	QRSA08J-821YN	RESISTOR	820Ω,1/10W
	R402	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R403	QRSA08J-105YN	RESISTOR	1MΩ,1/10W
	R404	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R405	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R406	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R407	QRSA08J-823YN	RESISTOR	82KΩ,1/10W
	R408	QRSA08J-105YN	RESISTOR	1MΩ,1/10W
	R409	QRSA08J-104	RESISTOR	100KΩ,1/10W
	R410	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
	R411	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R412	QRSA08J-273YN	RESISTOR	27KΩ,1/10W
	R413	QRSA08J-682	RESISTOR	6.8KΩ,1/10W
	R414	QRSA08J-105YN	RESISTOR	1MΩ,1/10W
	R415	QRSA08J-473	RESISTOR	47KΩ,1/10W
	R416	QRSA08J-684YN	RESISTOR	680KΩ,1/10W
	R417	QRSA08J-474YN	RESISTOR	470KΩ,1/10W
	R418	QRSA08J-224YN	RESISTOR	220KΩ,1/10W
	R419	QRSA08J-823YN	RESISTOR	82KΩ,1/10W
	R420	QRSA08J-105YN	RESISTOR	1MΩ,1/10W
	R421	QRSA08J-393YN	RESISTOR	39KΩ,1/10W
	R422	QRSA08J-822YN	RESISTOR	8.2KΩ,1/10W
	R423	QRSA08J-105YN	RESISTOR	1MΩ,1/10W
	R424	QRSA08J-124YN	RESISTOR	120KΩ,1/10W
	R425	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R426	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R427	QVZ3518-474AZ	V RESISTOR,SP PB SW POINT	470KΩ
	R428	QRSA08J-473	RESISTOR	47KΩ,1/10W
	R429	QRSA08J-104	RESISTOR	100KΩ,1/10W
	R434	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R435	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R440	QRSA08J-225YN	RESISTOR	2.2MΩ,1/10W
	C401	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C402	QEK61AM-226	E CAPACITOR	22μF,10V
	C403	QEK61AM-226	E CAPACITOR	22μF,10V
	C404	QCTA1CH-101	CAPACITOR	100PF,16V
	C406	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C407	QEK61HM-105	E CAPACITOR	1μF,50V
	C408	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C409	QFV71HJ-563	TF CAPACITOR	0.056μF,50V
	C410	QCYA1HK-102	CAPACITOR	0.001μF,50V
	C413	QEK61AM-226	E CAPACITOR	22μF,10V
	C414	QFV71HJ-104	TF CAPACITOR	0.1μF,50V
	C415	QFL31HJ-472	M CAPACITOR	0.0047μF,50V
	C416	QEK61EM-475	E CAPACITOR	4.7μF,25V
	C417	QEK61EM-475	E CAPACITOR	4.7μF,25V
	C418	QEK61CM-106	E CAPACITOR	10μF,16V
	C419	QEK61CM-106	E CAPACITOR	10μF,16V
	C420	QFV71HJ-473	TF CAPACITOR	0.047μF,50V
	C421	QEP61HM-105	NP E CAPACITOR	1μF,50V
	C422	QCTA1CH-101	CAPACITOR	100PF,16V
	C423	QFL31HJ-682	M CAPACITOR	0.0068μF,50V
	C426	QCTA1CH-181	CAPACITOR	180PF,16V
	C427	QFV71HJ-473	TF CAPACITOR	0.047μF,50V
	CN401	PU58844-3	CAP HOUSING	
	CN402	PU59555-4	CAP HOUSING	
	CN452	PEMC0714-011	CAP HOUSING	
⚠	CP401	ICP-N15	CP	

— DEMODULATOR SECTION —

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION
	IC502	CXA1011P	IC
	Q502	DTA114EU	TRANSISTOR
	Q503	DTA144EU	TRANSISTOR
	Q504	2SD1328S,T	TRANSISTOR
	Q505	2SD1328S,T	TRANSISTOR
	Q506	2SD1328S,T	TRANSISTOR
	Q507	DTA124EU	TRANSISTOR
	Q508	DTA124EU	TRANSISTOR
	Q509	DTC114EU	TRANSISTOR
	Q510	DTC114EU	TRANSISTOR

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
D501	1SS133	DIODE	
D502	1SS133	DIODE	
D503	1SS133	DIODE	
D504	1SS133	DIODE	
D505	1SS133	DIODE	
D506	1SS133	DIODE	
D509	1SS133	DIODE	
D510	1SS133	DIODE	
R509	QVZ3523-472AZ	V RESISTOR,SAP LEVEL	4.7KΩ
R519	QRSA08J-223YN	RESISTOR	22KΩ,1/10W
R520	QRSA08J-223YN	RESISTOR	22KΩ,1/10W
R525	QRSA08J-752YN	RESISTOR	7.5KΩ,1/10W
R526	QRV144F-5603AY	CMF RESISTOR	560KΩ,1/4W
R527	QRV144F-2322AY	CMF RESISTOR	23.2KΩ,1/4W
R528	QRSA08J-272YN	RESISTOR	2.7KΩ,1/10W
R529	QRSA08J-153	RESISTOR	15KΩ,1/10W
R530	QRSA08J-561YN	RESISTOR	560Ω,1/10W
R531	QRSA08J-361YN	RESISTOR	360Ω,1/10W
R532	QRSA08J-682	RESISTOR	6.8KΩ,1/10W
R533	QRSA08J-301YN	RESISTOR	300Ω,1/10W
R534	QRSA08J-272YN	RESISTOR	2.7KΩ,1/10W
R539	QRSA08J-151YN	RESISTOR	150Ω,1/10W
R540	QRSA08J-151YN	RESISTOR	150Ω,1/10W
R541	QRSA08J-332YN	RESISTOR	3.3KΩ,1/10W
R542	QRSA08J-332YN	RESISTOR	3.3KΩ,1/10W
R543	QRSA08J-332YN	RESISTOR	3.3KΩ,1/10W
R544	QRSA08J-561YN	RESISTOR	560Ω,1/10W
R545	QRSA08J-473	RESISTOR	47KΩ,1/10W
C524	QEK61CM-106	E CAPACITOR	10μF,16V
C525	QEE81CJ-335	TANTAL CAPACITOR	3.3μF,16V
C526	QEK61HM-105	E CAPACITOR	1μF,50V
C527	QEE81CJ-106	TANTAL CAPACITOR	10μF,16V
C528	QEK61HM-225	E CAPACITOR	2.2μF,50V
C529	QEK61CM-106	E CAPACITOR	10μF,16V
C530	QFL31HJ-472	M CAPACITOR	0.0047μF,50V
C531	QENC1CM-106	NP E CAPACITOR	10μF,16V
C532	QFV71HJ-223	TF CAPACITOR	0.022μF,50V
C533	QFV71HJ-104	TF CAPACITOR	0.1μF,50V
C534	QEK61HM-105	E CAPACITOR	1μF,50V
C535	QETC1CM-107	E CAPACITOR	100μF,16V
C536	QEK61HM-105	E CAPACITOR	1μF,50V
CN501	PU58844-3	CAP HOUSING	
CN502	PU58844-10	CAP HOUSING	

— MECHACON SECTION —

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
IC601	M37419M8-112SP	IC	
	or M37419E8-227SP	IC	
IC602	BA6251	IC	
Q601	2SB1425(EU)	TRANSISTOR	
Q602	DTC114EU	TRANSISTOR	
Q603	DTC124EU	TRANSISTOR	
Q610	DTC114EU	TRANSISTOR	
Q611	DTC114EU	TRANSISTOR	
D601	HZS7.5EB2	ZENER DIODE	
	or MTZ7.5B	ZENER DIODE	
D602	MA165	DIODE	
	or 1SS133	DIODE	
D603	MA165	DIODE	
	or 1SS133	DIODE	
D604	MA165	DIODE	
	or 1SS133	DIODE	
D605	MA165	DIODE	
	or 1SS133	DIODE	
D606	11ES2	DIODE	
D610	1SS133	DIODE	
R601	QRD161J-332	RESISTOR	3.3KΩ,1/6W
R602	QRSA08J-332YN	RESISTOR	3.3KΩ,1/10W
R603	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R604	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R605	QRSA08J-154YN	RESISTOR	150KΩ,1/10W
R606	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R608	QRSA08J-563YN	RESISTOR	56KΩ,1/10W
R609	QRSA08J-303YN	RESISTOR	30KΩ,1/10W
R610	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R611	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R612	QRSA08J-224YN	RESISTOR	220KΩ,1/10W
R613	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R614	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R615	QRSA08J-102	RESISTOR	1KΩ,1/10W
R616	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R617	QRSA08J-102	RESISTOR	1KΩ,1/10W
R619	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R620	QRSA08J-102	RESISTOR	1KΩ,1/10W
R621	QRSA08J-102	RESISTOR	1KΩ,1/10W
R622	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R623	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R624	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R625	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R626	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R627	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R628	QRSA08J-681YN	RESISTOR	680Ω,1/10W
R629	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R630	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R631	QRSA08J-105YN	RESISTOR	1MΩ,1/10W
R632	QRD161J-472	RESISTOR	4.7KΩ,1/6W
R633	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
R634	QRSA08J-471YN	RESISTOR	470Ω,1/10W
R636	QRSA08J-102	RESISTOR	1KΩ,1/10W
R640	QRSA08J-103YN	RESISTOR	10KΩ,1/10W

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION	
	R641	QRD161J-103	RESISTOR	10KΩ,1/6W
	R644	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R647	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R648	QRSA08J-152	RESISTOR	1.5KΩ,1/10W
	R651	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R652	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R653	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R655	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R660	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R661	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R667	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	RA601	QRB045J-103XC	RESISTOR ARRAY	
	RA602	QRB035J-103XC	RESISTOR ARRAY	
	C601	QEK61HM-105	E CAPACITOR	1μF,50V
	C602	QEK61HM-335	E CAPACITOR	3.3μF,50V
	C603	QETC0JM-107	E CAPACITOR	100μF,6.3V
	C604	QCFA1HZ-473	CAPACITOR	0.047μF,50V
	C605	QCFA1HZ-223	CAPACITOR	0.022μF,50V
	L601	PU59152-100J	COIL	10μH
⚠	CF601	PEVB0340	CERAMIC FILTER	
	CN601	PEMC0722-017	WIRE TRAP	
		or PEMC0753-017	WIRE TRAP	
	CN602	PU59555-4	CAP HOUSING	
	CN603	PU60417-4	CAP HOUSING	
	CN604	PU59555-3	CAP HOUSING	
⚠	CP601	ICP-N25	CP	
⚠	CP602	ICP-F20	CIRCUIT PROTECTOR	

— REGULATOR SECTION —

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION	
	Q801	2SA1020	TRANSISTOR	
		or 2SB1010(QR)	TRANSISTOR	
	Q804	2SA1576(RS)	TRANSISTOR	
	Q808	DTC114ES	TRANSISTOR	
	D801	1SS133	DIODE	
		or MA165	DIODE	
	D802	1SS133	DIODE	
		or MA165	DIODE	
	D803	1SS133	DIODE	
		or MA165	DIODE	
	D804	1SS133	DIODE	
		or MA165	DIODE	
	D810	1SS133	DIODE	
	R801	QRD161J-222	RESISTOR	2.2KΩ,1/6W
	R804	QRD161J-182	RESISTOR	1.8KΩ,1/6W
	R806	QRSA08J-393YN	RESISTOR	39KΩ,1/10W
	R807	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R809	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	C801	QETC1CM-336	E CAPACITOR	33μF,16V
	C809	QCVB1CM-103	CAPACITOR	0.01μF,16V
	C810	QCXB1CM-222	CAPACITOR	0.0022μF,16V
	C811	QCVB1CM-103	CAPACITOR	0.01μF,16V
	C812	QCVB1CM-103	CAPACITOR	0.01μF,16V
	C821	QETC1CM-336	E CAPACITOR	33μF,16V
	L801	PU48530-101K	COIL	100μH
	CN801	PU61044-11	CAP HOUSING	
	CN802	PU60910-6	CAP HOUSING	
	CN803	PU60910-9	CAP HOUSING	
	CN902	PEMC0714-011	CAP HOUSING	
⚠	CP801	ICP-N15	CP	
⚠	CP802	ICP-N10	CP	
⚠	CP803	ICP-N15	CIRCUIT PROTECTOR	

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VIDEO UNIT BOARD ASSEMBLY <05>

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION
	PWBA	PB10321A-02	VIDEO UNIT BOARD ASSEMBLY
	IC1	PB20166A-01	Y MODULE BOARD ASSY
⚠	IC2	MSM6866RS	IC
	IC201	HA118125NT	IC

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION
Q1	DTC144WU	TRANSISTOR
Q2	2SC4081(QRS)	TRANSISTOR
Q3	DTA114EU	TRANSISTOR
Q4	2SA1577(Q)	TRANSISTOR
Q5	2SA1576(QRS)	TRANSISTOR
Q6	DTA114EU	TRANSISTOR
Q7	DTA144EU	TRANSISTOR
Q8	2SC4081(QRS)	TRANSISTOR
Q9	DTC144EU	TRANSISTOR
Q10	2SA1576(QRS)	TRANSISTOR
Q11	DTC144WU	TRANSISTOR
Q12	2SA1576(QRS)	TRANSISTOR
Q13	2SC4081(QRS)	TRANSISTOR
Q14	DTC144EU	TRANSISTOR
Q15	DTA124EU	TRANSISTOR
Q16	2SC4081(QRS)	TRANSISTOR
Q201	2SC4098(PQ)	TRANSISTOR
Q202	DTC144WU	TRANSISTOR
Q203	DTA144WU	TRANSISTOR
Q204	DTC124EU	TRANSISTOR
D1	1SS133	DIODE
	or MA165	DIODE
D2	1SS133	DIODE
	or MA165	DIODE
D3	1SS133	DIODE
	or MA165	DIODE
D4	1SS133	DIODE
	or MA165	DIODE
D5	1SS292	DIODE
D6	1SS133	DIODE
	or MA165	DIODE
D7	1SS133	DIODE
	or MA165	DIODE
D8	RD9.1ES-T1B2	ZENER DIODE
	or UZ9.1BSB	ZENER DIODE
D9	1SS133	DIODE
	or MA165	DIODE
D10	1SS133	DIODE
	or MA165	DIODE
D11	1SS133	DIODE
	or MA165	DIODE
D12	1SS133	DIODE
	or MA165	DIODE
D13	1SS133	DIODE
	or MA165	DIODE
D14	1SS133	DIODE
	or MA165	DIODE
D15	1SS133	DIODE
	or MA165	DIODE
D16	1SS133	DIODE
	or MA165	DIODE
D17	1SS133	DIODE
	or MA165	DIODE
D18	1SS133	DIODE
	or MA165	DIODE

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
D19	1SS133	DIODE	
	or MA165	DIODE	
D201	1SS133	DIODE	
	or MA165	DIODE	
D202	1SS133	DIODE	
	or MA165	DIODE	
D203	1SS133	DIODE	
	or MA165	DIODE	
D204	MA141WK	DIODE	
	or DAN202U	DIODE	
D205	1SS133	DIODE	
	or MA165	DIODE	
D206	1SS133	DIODE	
	or MA165	DIODE	
D207	MA141WK	DIODE	
	or DAN202U	DIODE	
D208	1SS133	DIODE	
	or MA165	DIODE	
R1	QRSA08J-272YN	RESISTOR	2.7KΩ,1/10W
R2	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
R3	QRSA08J-682YN	RESISTOR	6.8KΩ,1/10W
R4	QRD161J-331	RESISTOR	330Ω,1/6W
R5	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
R6	QRSA08J-681YN	RESISTOR	680Ω,1/10W
R7	QRSA08J-182YN	RESISTOR	1.8KΩ,1/10W
R8	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
R9	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
R10	QRSA08J-822YN	RESISTOR	8.2KΩ,1/10W
R11	QRSA08J-123YN	RESISTOR	12KΩ,1/10W
R12	QRD123J-391SX	RESISTOR	390Ω,1/2W
R13	QRSA08J-123YN	RESISTOR	12KΩ,1/10W
R14	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R15	QRSA08J-471YN	RESISTOR	470Ω,1/10W
R16	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
R17	QRSA08J-391YN	RESISTOR	390Ω,1/10W
R18	QRSA08J-681YN	RESISTOR	680Ω,1/10W
R19	QRSA08J-272YN	RESISTOR	2.7KΩ,1/10W
R20	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
R21	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R22	QRSA08J-104YN	RESISTOR	100KΩ,1/10W
R23	QRSA08J-272YN	RESISTOR	2.7KΩ,1/10W
R24	QRSA08J-334YN	RESISTOR	330KΩ,1/10W
R25	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R26	QRSA08J-221YN	RESISTOR	220Ω,1/10W
R28	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
R29	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R30	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
R31	QVZ3518-222AZ	V RESISTOR,YNR NC BAL	2.2KΩ
	or QVZ3523-222AZ	V RESISTOR	2.2KΩ
R32	QRSA08J-182YN	RESISTOR	1.8KΩ,1/10W
R33	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
R34	QRSA08J-392YN	RESISTOR	3.9KΩ,1/10W
R35	QRD161J-181	RESISTOR	180Ω,1/6W
R37	QRD161J-182	RESISTOR	1.8KΩ,1/6W
R38	QRSA08J-102YN	RESISTOR	1KΩ,1/10W

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
R39	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
R40	QRSA08J-332YN	RESISTOR	3.3KΩ,1/10W
R41	QRSA08J-182YN	RESISTOR	1.8KΩ,1/10W
R42	QRSA08J-101YN	RESISTOR	100Ω,1/10W
R43	QRSA08J-273YN	RESISTOR	27KΩ,1/10W
R201	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
R202	QRSA08J-221YN	RESISTOR	220Ω,1/10W
R203	QRSA08J-821YN	RESISTOR	820Ω,1/10W
R204	QRD161J-103	RESISTOR	10KΩ,1/6W
R205	QRSA08G-102YN	RESISTOR	1KΩ,1/10W
R206	QRSA08J-331YN	RESISTOR	330Ω,1/10W
R207	QRSA08J-471YN	RESISTOR	470Ω,1/10W
R208	QRSA08J-331YN	RESISTOR	330Ω,1/10W
R209	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
R210	QRD161J-102	RESISTOR	1KΩ,1/6W
R211	QRSA08J-273YN	RESISTOR	27KΩ,1/10W
R212	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
R213	QRD161J-102	RESISTOR	1KΩ,1/6W
R214	QRD161G-471	RESISTOR	470Ω,1/6W
R215	QRSA08G-751YN	RESISTOR	750Ω,1/10W
R216	QRSA08J-104YN	RESISTOR	100KΩ,1/10W
R217	QRSA08J-155YN	RESISTOR	1.5MΩ,1/10W
R218	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
R219	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
C1	QCSA1HJ-270	CAPACITOR	27PF,50V
C2	QCSA1HJ-470	CAPACITOR	47PF,50V
C3	QETC1AM-226	E CAPACITOR	22μF,10V
C4	QETC1HM-335	E CAPACITOR	3.3μF,50V
C5	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C6	QCSA1HJ-200	CAPACITOR	20PF,50V
C7	QCSA1HJ-330	CAPACITOR	33PF,50V
C8	QCSA1HJ-271	CAPACITOR	270PF,50V
C9	QCSA1HJ-181	CAPACITOR	180PF,50V
C10	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C11	QCVB1CN-103	CAPACITOR	0.01μF,16V
C12	QETC1CM-336	E CAPACITOR	33μF,16V
C13	QETC0JM-108	E CAPACITOR	1000μF,6.3V
C14	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C15	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C16	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C17	QCSA1HJ-220	CAPACITOR	22PF,50V
C18	QCSA1HJ-270	CAPACITOR	27PF,50V
C19	QEN61AM-336	NP E CAPACITOR	33μF,10V
	or QENC1AM-336	NP E CAPACITOR	33μF,10V
C20	QETC1CM-106	E CAPACITOR	10μF,16V
C21	QETC1HM-224	E CAPACITOR	0.22μF,50V
C22	QETC1EM-335	E CAPACITOR	3.3μF,25V
C23	QCC31CK-823	CAPACITOR	0.082μF,16V
C24	QETC0JM-337	E CAPACITOR	330μF,6.3V
C25	QETC1EM-335	E CAPACITOR	3.3μF,25V
C26	QEN61HM-225	NP E CAPACITOR	2.2μF,50V
	or QENC1HM-225	NP.E CAP	2.2μF,50V
C27	QETC1EM-475	E CAPACITOR	4.7μF,25V
C28	QETC1HM-334	E CAPACITOR	0.33μF,50V

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
C29	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C30	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C31	QETC1EM-475	E CAPACITOR	4.7μF,25V
C32	QCSA1HJ-330	CAPACITOR	33PF,50V
C33	QCYA1HK-102	CAPACITOR	0.001μF,50V
C34	QETC0JM-476	E CAPACITOR	47μF,6.3V
C35	QCYA1HK-102	CAPACITOR	0.001μF,50V
C36	QCYA1HK-102	CAPACITOR	0.001μF,50V
C37	QETC1AM-476	E CAPACITOR	47μF,10V
C38	QEN61CM-106	NP E CAPACITOR	10μF,16V
	or QENC1CM-106	NP E CAPACITOR	10μF,16V
C39	QCYA1HK-102	CAPACITOR	0.001μF,50V
C41	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C201	QETC0JM-337	E CAPACITOR	330μF,6.3V
C202	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C203	QCFA1EZ-104	CAPACITOR	0.1μF,25V
C204	QCFA1HZ-223	CAPACITOR	0.022μF,50V
C205	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C206	QCF81EZ-224	CAPACITOR	0.22μF,25V
C207	QCFA1EZ-104	CAPACITOR	0.1μF,25V
C208	QETC1EM-335	E CAPACITOR	3.3μF,25V
C209	QCFA1EZ-104	CAPACITOR	0.1μF,25V
C210	QETC0JM-337	E CAPACITOR	330μF,6.3V
C211	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C212	QCSA1HJ-101	CAPACITOR	100PF,50V
C213	QCSA1HJ-680	CAPACITOR	68PF,50V
C214	QCSA1HG-360	CAPACITOR	36PF,50V
C215	QCSA1HJ-221	CAPACITOR	220PF,50V
C216	QCFA1HZ-473	CAPACITOR	0.047μF,50V
C217	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C218	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C219	QETC1HM-474	E CAPACITOR	0.47μF,50V
C220	QCBB1HJ-102	CAPACITOR	0.001μF,50V
C221	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C222	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C223	QETC1HM-224	E CAPACITOR	0.22μF,50V
C224	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C225	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C226	QCFB1EZ-223	CAPACITOR	0.022μF,25V
C227	QETC1HM-104	E CAPACITOR	0.1μF,50V
C228	QETC1EM-475	E CAPACITOR	4.7μF,25V
C229	QCYA1HK-332	CAPACITOR	0.0033μF,50V
C230	QETC1HM-105	E CAPACITOR	1μF,50V
C232	QCYA1EJ-103	CAPACITOR	0.01μF,25V
C233	QCC11EJ-152	CAPACITOR	0.0015μF,25V
L1	PU59988-121JY	COIL	120μH
L2	PU59988-470JY	COIL	47μH
L3	PU59988-390JY	COIL	39μH
L4	PU59988-221JY	COIL	220μH
L5	PU59988-330JY	COIL	33μH
L6	PU59988-820JY	COIL	82μH
L7	PU48530-271J	COIL	270μH
L8	PU48530-101K	COIL	100μH

#△ REF No.	PART No.	PART NAME, DESCRIPTION	
L9	PU59988-680JY	COIL	68μH
L10	PU59988-680JY	COIL	68μH
L11	PU59153-101K	COIL	100μH
L12	PU59988-680JY	COIL	68μH
L13	PU59988-R22KY	COIL	0.22μH
L14	PU59988-R22KY	COIL	0.22μH
L201	PU59153-101K	COIL	100μH
L202	PU48530-222J	COIL	2.2mH
L203	PU60165-150G	COIL	15μH
L204	PU48530-561J	COIL	560μH
EQ1	PU60056-2	EQUALIZER	
	or PU60056	EQUALIZER	
LPF1	PU60632	LOW PASS FILTER	
LPF2	PU60055	LOW PASS FILTER	
LPF201	PU60128-2	LOW PASS FILTER	
BPF201	PU60631	BAND PASS FILTER	
CF201	PU58852	CERAMIC FILTER	
DL201	PU60058-2	DELAY LINE	
	or PU60322	DELAY LINE	
	or PU60058	DELAY LINE	
△ X201	PU60059	CRYSTAL RESONATOR	
T201	PU60057-3	TANK FILTER	
	or PU60057-2	TANK FILTER	
SLD1	PU61177	SHIELD CASE	
SLD2	PU61178	SHIELD PLATE	
CN1	PEMC0712-113	PIN HEADER	
CN2	PEMC0712-114	PIN HEADER	
CN3	PEMC0712-111	PIN HEADER	

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AUDIO UNIT BOARD ASSEMBLY <09>

#△ REF No.	PART No.	PART NAME, DESCRIPTION
PWBA	PB10298E-01	AUDIO UNIT BOARD ASSY
IC1	PB20167B-02	FMA MODULE BOARD ASSY
IC2	SN74HCU04N	IC
	or BU74HCU04	IC
IC101	BA15218	IC
	or XRA15218	IC
Q1	2SC4081(QR)	TRANSISTOR
Q2	2SC4081(QR)	TRANSISTOR
Q4	2SC4081(QR)	TRANSISTOR
Q5	2SC4081(QR)	TRANSISTOR
Q6	2SC4097(RS)	TRANSISTOR
Q7	2SC4081(QR)	TRANSISTOR
Q8	DTA114EU	TRANSISTOR
Q10	DTA114EU	TRANSISTOR
Q11	DTC114EU	TRANSISTOR
Q12	DTC143TU	TRANSISTOR
Q13	DTA114EU	TRANSISTOR
Q14	2SC4097(QR)	TRANSISTOR
Q15	2SA1577(QR)	TRANSISTOR
Q16	DTC124EU	TRANSISTOR
Q17	2SC4081(QR)	TRANSISTOR
Q18	2SC1740S(RS)	TRANSISTOR
Q19	2SD1450S,T	TRANSISTOR
Q20	2SD1450S,T	TRANSISTOR
Q21	DTA114TU	TRANSISTOR
Q101	2SC4081(QR)	TRANSISTOR
Q102	2SC4081(QR)	TRANSISTOR
Q103	2SC4081(QR)	TRANSISTOR
D1	1SS133	DIODE
D3	DAP202U	DIODE
D4	1SS133	DIODE
D7	1SS133	DIODE
D8	1SS133	DIODE
D9	1SS133	DIODE
D10	1SS133	DIODE
D11	1SS133	DIODE
D12	1SS133	DIODE
D13	1SS133	DIODE
D14	1SS133	DIODE
D15	1SS133	DIODE
D16	1SS133	DIODE

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION	
	D19	DAN202U	DIODE	
	D20	1SS133	DIODE	
	R1	QRSA08J-151YN	RESISTOR	150Ω,1/10W
	R2	QRSA08J-151YN	RESISTOR	150Ω,1/10W
	R3	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
	R4	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
	R5	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
	R6	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R7	QRSA08J-243YN	RESISTOR	24KΩ,1/10W
	R8	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
	R9	QRSA08J-331YN	RESISTOR	330Ω,1/10W
	R10	QRSA08J-183YN	RESISTOR	18KΩ,1/10W
	R11	QRSA08J-473YN	RESISTOR	47KΩ,1/10W
	R12	QRSA08J-274YN	RESISTOR	270KΩ,1/10W
	R13	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R14	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R15	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
	R16	QRSA08J-392YN	RESISTOR	3.9KΩ,1/10W
	R17	QRSA08J-0R0YN	RESISTOR	0Ω,1/10W
	R18	QRSA08J-183YN	RESISTOR	18KΩ,1/10W
	R19	QRSA08J-101YN	RESISTOR	100Ω,1/10W
	R20	QRSA08J-0R0YN	RESISTOR	0Ω,1/10W
	R21	QRSA08J-472YN	RESISTOR	4.7KΩ,1/10W
	R22	QRSA08J-472YN	RESISTOR	4.7KΩ,1/10W
	R23	QRSA08J-273YN	RESISTOR	27KΩ,1/10W
	R24	QRSA08J-3R9YN	RESISTOR	3.9Ω,1/10W
	R25	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
	R26	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
	R27	QRSA08J-472YN	RESISTOR	4.7KΩ,1/10W
	R28	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
	R29	QRSA08J-0R0YN	RESISTOR	0Ω,1/10W
	R30	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R31	QRSA08J-153	RESISTOR	15KΩ,1/10W
	R32	QRSA08J-223YN	RESISTOR	22KΩ,1/10W
	R33	QRSA08J-6R8YN	RESISTOR	6.8Ω,1/10W
	R34	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R35	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R36	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R37	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R38	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
	R39	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R40	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R41	QRSA08J-273YN	RESISTOR	27KΩ,1/10W
	R42	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R43	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R45	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R46	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
	R47	QRSA08J-183YN	RESISTOR	18KΩ,1/10W
	R48	QRSA08J-272YN	RESISTOR	2.7KΩ,1/10W
	R49	QRSA08J-273YN	RESISTOR	27KΩ,1/10W
	R50	QRSA08J-105YN	RESISTOR	1MΩ,1/10W
	R51	QRSA08J-105YN	RESISTOR	1MΩ,1/10W
	R52	QRSA08J-105YN	RESISTOR	1MΩ,1/10W
	R53	QRSA08J-105YN	RESISTOR	1MΩ,1/10W
	R55	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R56	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
	R57	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
	R58	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
	R59	QRSA08J-682YN	RESISTOR	6.8KΩ,1/10W
	R60	QRSA08J-152YN	RESISTOR	1.5KΩ,1/10W
	R61	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
	R62	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R63	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R64	QRSA08J-221YN	RESISTOR	220Ω,1/10W
	R65	QRSA08J-101YN	RESISTOR	100Ω,1/10W
	R66	QRSA08J-561YN	RESISTOR	560Ω,1/10W
	R67	QRSA08J-561YN	RESISTOR	560Ω,1/10W
	R68	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
	R79	QRSA08J-471YN	RESISTOR	470Ω,1/10W
	R82	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
	R83	QRD161J-102	RESISTOR	1KΩ,1/6W
⚠	R84	QRSA08J-121	RESISTOR	120Ω,1/10W
	R85	QRSA08J-151YN	RESISTOR	150Ω,1/10W
	R101	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R102	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R103	QRSA08J-362YN	RESISTOR	3.6KΩ,1/10W
	R104	QRSA08J-362YN	RESISTOR	3.6KΩ,1/10W
	R105	QRSA08J-561YN	RESISTOR	560Ω,1/10W
	R106	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R107	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R108	QRSA08J-223YN	RESISTOR	22KΩ,1/10W
	R109	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
	R110	QRSA08J-101YN	RESISTOR	100Ω,1/10W
	R111	QRSA08J-104	RESISTOR	100KΩ,1/10W
	R112	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R113	QRSA08J-101YN	RESISTOR	100Ω,1/10W
	R114	QRSA08J-104	RESISTOR	100KΩ,1/10W
	R115	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R116	QRSA08J-104	RESISTOR	100KΩ,1/10W
	R117	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R118	QRSA08J-221YN	RESISTOR	220Ω,1/10W
	R120	QRSA08J-823YN	RESISTOR	82KΩ,1/10W
	C1	QEK61CM-106	E CAPACITOR	10µF,16V
	C2	QEK61CM-106	E CAPACITOR	10µF,16V
	C4	QEK61HM-225	E CAPACITOR	2.2µF,50V
	C5	QEK61CM-106	E CAPACITOR	10µF,16V
	C6	QEK61CM-106	E CAPACITOR	10µF,16V
	C7	QEK61CM-106	E CAPACITOR	10µF,16V
	C8	QEK61CM-476	E CAPACITOR	47µF,16V
	C9	QEK61CM-106	E CAPACITOR	10µF,16V
	C10	QEK60JM-336	E CAPACITOR	33µF,6.3V
	C11	QEK60JM-336	E CAPACITOR	33µF,6.3V
	C12	QEK61CM-106	E CAPACITOR	10µF,16V
	C13	QEB61CM-685	E CAPACITOR	6.8µF,16V
	C14	PU60550-105	E CAPACITOR	1µF
	C15	QCSA1HJ-561	CAPACITOR	560PF,50V
	C16	QCYA1HK-332	CAPACITOR	0.0033µF,50V

#△ REF No.	PART No.	PART NAME, DESCRIPTION	
C17	QCYA1HK-123	CAPACITOR	0.012μF,50V
C18	QCSA1HJ-471	CAPACITOR	470PF,50V
C19	QEK61CM-106	E CAPACITOR	10μF,16V
C20	QCYA1HK-123	CAPACITOR	0.012μF,50V
C21	QEK61HM-105	E CAPACITOR	1μF,50V
C22	NCR21CK-563A	CAPACITOR	0.056μF,16V
C23	QFV71HJ-184	TF CAPACITOR	0.18μF,50V
C24	QCSA1HJ-331	CAPACITOR	330PF,50V
C25	QFV71HJ-223	TF CAPACITOR	0.022μF,50V
C26	QCYA1HK-222	CAPACITOR	0.0022μF,50V
C27	QEK61HM-475	E CAPACITOR	4.7μF,50V
C28	QCYA1HK-102	CAPACITOR	0.001μF,50V
C29	QEK60JM-476	E CAPACITOR	47μF,6.3V
C30	QEK61AM-336	E CAPACITOR	33μF,10V
C31	QEK61HM-225	E CAPACITOR	2.2μF,50V
C32	QCFA1HZ-333	CAPACITOR	0.033μF,50V
C33	QEK61CM-106	E CAPACITOR	10μF,16V
C34	QCYA1HK-332	CAPACITOR	0.0033μF,50V
C35	QCYA1HK-102	CAPACITOR	0.001μF,50V
C36	QEK61CM-476	E CAPACITOR	47μF,16V
C37	QFV81HJ-224	TF CAPACITOR	0.22μF,50V
C38	QFV71HJ-474	TF CAPACITOR	0.47μF,50V
C40	QCSA1HJ-102	CAPACITOR	0.001μF,50V
C43	QCYA1HK-102	CAPACITOR	0.001μF,50V
C44	QEK61CM-106	E CAPACITOR	10μF,16V
C45	QEK61CM-106	E CAPACITOR	10μF,16V
C46	QEK61CM-106	E CAPACITOR	10μF,16V
C47	QETB1AM-476	E CAPACITOR	47μF,10V
C48	QEP61CM-106	NP E CAPACITOR	10μF,16V
C49	QEK61CM-106	E CAPACITOR	10μF,16V
C50	QEK61CM-226	E CAPACITOR	22μF,16V
C51	QEK61HM-225	E CAPACITOR	2.2μF,50V
C52	QEK61AM-336	E CAPACITOR	33μF,10V
C53	QEK61CM-476	E CAPACITOR	47μF,16V
C54	QCYA1HK-102	CAPACITOR	0.001μF,50V
C55	QEK61AM-336	E CAPACITOR	33μF,10V
C56	QETB0JM-107	E CAPACITOR	100μF,6.3V
C57	QEK61CM-226	E CAPACITOR	22μF,16V
C58	QEK61CM-106	E CAPACITOR	10μF,16V
C59	QEP61CM-106	NP E CAPACITOR	10μF,16V
C60	QETC1AM-476	E CAPACITOR	47μF,10V
C61	QEK61CM-106	E CAPACITOR	10μF,16V
C62	QEK60JM-476	E CAPACITOR	47μF,6.3V
C64	QEK61CM-476	E CAPACITOR	47μF,16V
C65	QCFA1EZ-104	CAPACITOR	0.1μF,25V
C66	QEK61CM-476	E CAPACITOR	47μF,16V
C101	QEK61CM-336	E CAPACITOR	33μF,16V
C102	QEK61CM-476	E CAPACITOR	47μF,16V
C103	QEK61CM-106	E CAPACITOR	10μF,16V
C104	QEK61CM-106	E CAPACITOR	10μF,16V
C105	QEN61CM-106	NP E CAPACITOR	10μF,16V
C106	QEN61CM-106	NP E CAPACITOR	10μF,16V
C107	QEN61CM-106	NP E CAPACITOR	10μF,16V
C108	QEK61HM-105	E CAPACITOR	1μF,50V
C109	QEK61HM-225	E CAPACITOR	2.2μF,50V
C110	QCSA1HJ-101	CAPACITOR	100PF,50V

#△ REF No.	PART No.	PART NAME, DESCRIPTION	
C111	QEN61CM-106	NP E CAPACITOR	10μF,16V
L1	PU58308-222J	COIL	2.2mH
L2	PU48530-101J	COIL	100μH
L3	PU48530-101J	COIL	100μH
L4	PU53618-101J	COIL	100μH
BPF1	PU60396	BAND PASS FILTER	
BPF2	PU60397	BAND PASS FILTER	
△ T1	PU60320	OSC TRANSFORMER	
△ T2	PU60321	OSC TRANSFORMER	
CN1	PEMC0712-110	PIN HEADER	
CN2	PEMC0712-116	PIN HEADER	
CN3	PEMC0712-117	PIN HEADER	
CN4	PEMC0712-111	PIN HEADER	

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A/C HEAD BOARD ASSEMBLY <12>

PWB1	PB40068	AUDIO CONTROL HEAD BOARD
CN1	PU58844-107	CAP HOUSING

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DEMODULATOR BOARD ASSEMBLY <14>

PWBA1	PB20453A-01	DEMODULATOR BOARD ASSEMBLY
IC501	UPC1870CA	IC
Q501	2SD1450S,T	TRANSISTOR

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
Q512	2SD1450S,T	TRANSISTOR	
R501	QVZ3531-103	V RESISTOR,SAP BPF	10KΩ
R502	QVZ3531-473	V RESISTOR,VCO	47KΩ
R503	QVZ3531-473	V RESISTOR,LPF	47KΩ
R504	QVZ3523-683AZ	V RESISTOR,SEPARATION	68KΩ
R505	QVZ3523-104AZ	V RESISTOR,SEPARATION	100KΩ
R506	QVZ3523-472AZ	V RESISTOR,SAP LEVEL	4.7KΩ
R507	QVZ3523-102AZ	V RESISTOR,L.LEVEL	1KΩ
R508	QVZ3523-102AZ	V RESISTOR,R.LEVEL	1KΩ
R511	QRSA08J-153	RESISTOR	15KΩ,1/10W
R512	QRSA08J-182YN	RESISTOR	1.8KΩ,1/10W
R513	QRV144F-1002AY	CMF RESISTOR	10.0KΩ,1/4W
R515	QRV144F-7502AY	RESISTOR	75.0KΩ,1/4W
R516	QRV144F-5493AY	RESISTOR	549KΩ,1/4W
R517	QRSA08J-563YN	RESISTOR	56KΩ,1/10W
R518	QRSA08J-124YN	RESISTOR	120KΩ,1/10W
R519	QRSA08J-223YN	RESISTOR	22KΩ,1/10W
R520	QRSA08J-223YN	RESISTOR	22KΩ,1/10W
R521	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R522	QRSA08J-303YN	RESISTOR	30KΩ,1/10W
R523	QRV144F-8202AY	RESISTOR	82.0KΩ,1/4W
R524	QRSA08J-102	RESISTOR	1KΩ,1/10W
R535	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
R536	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
R537	QRSA08J-102	RESISTOR	1KΩ,1/10W
R538	QRSA08J-102	RESISTOR	1KΩ,1/10W
R550	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R552	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R554	QRD161J-271	RESISTOR	270Ω,1/6W
C501	QETC1CM-107	E CAPACITOR	100μF,16V
C502	QEK61CM-106	E CAPACITOR	10μF,16V
C503	QFV71HJ-154	TF CAPACITOR	0.15μF,50V
C504	QCBB1HJ-102	CAPACITOR	0.001μF,50V
C505	QFV71HJ-104	TF CAPACITOR	0.1μF,50V
C506	QEK61HM-474	E CAPACITOR	0.47μF,50V
C507	QEK61CM-106	E CAPACITOR	10μF,16V
C509	QEK61HM-474	E CAPACITOR	0.47μF,50V
C510	QEK61HM-474	E CAPACITOR	0.47μF,50V
C511	QEK61HM-474	E CAPACITOR	0.47μF,50V
C512	QEE81CJ-335	TANTAL CAPACITOR	3.3μF,16V
C513	QEE81VJ-105	TANTAL CAPACITOR	1μF,35V
C514	QFV71HJ-104	TF CAPACITOR	0.1μF,50V
C515	QEK61CM-106	E CAPACITOR	10μF,16V
C516	QEK61CM-106	E CAPACITOR	10μF,16V
C517	QEK61HM-225	E CAPACITOR	2.2μF,50V
C518	QEK61HM-105	E CAPACITOR	1μF,50V
C519	QEK61HM-475	E CAPACITOR	4.7μF,50V
C520	QETC1CM-107	E CAPACITOR	100μF,16V
C521	QEK61CM-226	E CAPACITOR	22μF,16V
C522	QFV71HJ-223	TF CAPACITOR	0.022μF,50V
C523	QEK61HM-105	E CAPACITOR	1μF,50V
C537	QEK61CM-106	E CAPACITOR	10μF,16V
C538	QEK61CM-106	E CAPACITOR	10μF,16V
C539	QFV71HJ-123	TF CAPACITOR	0.012μF,50V
C540	QFV71HJ-123	TF CAPACITOR	0.012μF,50V
C541	QCVB1CN-103	CAPACITOR	0.01μF,16V
C542	QETC1CM-107	E CAPACITOR	100μF,16V
L501	PU60211	LOW PASS FILTER	
L502	PU60211	LOW PASS FILTER	
SPC501	PU59210-003	W.LOKING SPACER,X4	
CN501	PU58844-3	CAP HOUSING	
CN502	PU58844-10	CAP HOUSING	

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ON SCREEN BOARD ASSEMBLY <17>

PWBA5	PB10447A5-01	ONSCREEN BOARD ASSY
IC901	M50554-168SP	IC
IC951	M52684AP	IC
Q901	DTA114EU	TRANSISTOR
Q902	DTA114EU	TRANSISTOR
Q903	2SA1576(RS)	TRANSISTOR
Q904	2SA1576(RS)	TRANSISTOR
Q905	2SA1576(RS)	TRANSISTOR
Q906	DTC114EU	TRANSISTOR
Q971	DTC114EU	TRANSISTOR
Q972	2SC4081(RS)	TRANSISTOR
Q973	2SK665	TRANSISTOR
Q974	DTC144EU	TRANSISTOR
D971	DAP202U	DIODE

#⚠	REF No.	PART No.	PART NAME, DESCRIPTION	
	R901	QRSA08J-471YN	RESISTOR	470Ω,1/10W
	R902	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R903	QRSA08J-681YN	RESISTOR	680Ω,1/10W
	R904	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R905	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R906	QRSA08J-471YN	RESISTOR	470Ω,1/10W
	R907	QRSA08J-471YN	RESISTOR	470Ω,1/10W
	R908	QRSA08J-392YN	RESISTOR	3.9KΩ,1/10W
	R909	QRSA08J-392YN	RESISTOR	3.9KΩ,1/10W
	R911	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
	R912	QRSA08J-272YN	RESISTOR	2.7KΩ,1/10W
	R916	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R917	QRSA08J-123YN	RESISTOR	12KΩ,1/10W
	R918	QRSA08J-102	RESISTOR	1KΩ,1/10W
	R919	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R921	QRSA08J-221YN	RESISTOR	220Ω,1/10W
	R924	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
	R926	QRSA08J-182YN	RESISTOR	1.8KΩ,1/10W
	R930	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R931	QRSA08J-471YN	RESISTOR	470Ω,1/10W
	R932	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
	R933	QRSA08J-0R0YN	RESISTOR	0Ω,1/10W
	R941	QRSA08J-222	RESISTOR	2.2KΩ,1/10W
	R942	QRD161J-103	RESISTOR	10KΩ,1/6W
	R952	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
	R953	QRSA08J-271YN	RESISTOR	270Ω,1/10W
	R954	QRSA08J-152	RESISTOR	1.5KΩ,1/10W
	R955	QRSA08J-154YN	RESISTOR	150KΩ,1/10W
	R956	QRSA08J-223YN	RESISTOR	22KΩ,1/10W
	R971	QRSA08J-123YN	RESISTOR	12KΩ,1/10W
	R972	QRSA08J-563YN	RESISTOR	56KΩ,1/10W
	R973	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
	R974	QRSA08J-563YN	RESISTOR	56KΩ,1/10W
	R975	QRSA08J-0R0YN	RESISTOR	0Ω,1/10W
	C901	QETC1CM-227	E CAPACITOR	220μF,16V
	C902	QCFA1HZ-103	CAPACITOR	0.01μF,50V
	C903	QEK61CM-106	E CAPACITOR	10μF,16V
	C904	QCVB1CN-103	CAPACITOR	0.01μF,16V
	C905	QAT3123-450	TRIM CAP,DOT CLOCK	45PF
	C906	QCTA1CH-330	CAPACITOR	33PF,16V
	C907	QCTA1CH-470	CAPACITOR	47PF,16V
	C909	QCFA1HZ-103	CAPACITOR	0.01μF,50V
	C910	QCTA1CH-270	CAPACITOR	27PF,16V
	C911	QEP41HM-105	NP E CAPACITOR	1μF,50V
	C912	QCSA1HJ-270	CAPACITOR	27PF,50V
	C915	QCTA1CH-220	CAPACITOR	22PF,16V
	C916	QAT3123-300	TRIM CAP,COLOR BURST	30PF
	C921	QCTA1CH-181	CAPACITOR	180PF,16V
	C922	QCTA1CH-101	CAPACITOR	100PF,16V
	C923	QCTA1CH-560	CAPACITOR	56PF,16V
	C924	QCSA1HJ-560	CAPACITOR	56PF,50V
	C951	QFN31HJ-562	M CAPACITOR	0.0056μF,50V
	C952	QCTA1CH-220	CAPACITOR	22PF,16V
	C953	QCFA1HZ-152	CAPACITOR	0.0015μF,50V
	C954	QCFA1HZ-103	CAPACITOR	0.01μF,50V
	C955	QEK61HM-105	E CAPACITOR	1μF,50V
	C956	QEK61CM-106	E CAPACITOR	10μF,16V
	C957	QCFA1HZ-103	CAPACITOR	0.01μF,50V
	C959	QEK61HM-335	E CAPACITOR	3.3μF,50V
	C971	QEK61HM-334	E CAPACITOR	0.33μF,50V
	L901	PU54223-101K	COIL	100μH
	L902	PU58333-220J	COIL	22μH
	L905	PU59152-220J	COIL	22μH
	L906	PU59152-220J	COIL	22μH
⚠	CF951	PU60086	RESONATOR	
⚠	X901	PU60747	CRYSTAL RESONATOR	
	CN901	PEMC0713-111	HOUSING	

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TIMER/DISP/SW BOARD ASSEMBLY <21>

PWBA2	PB10447A2-01	T/D/S BOARD ASSY	
IC701	HD404729RY12S	I C(MCU)	
	or HD4074729S9Y12	IC	
IC702	CAT93C46P	IC	
IC703	GP1U541X	INFRARED RAYS UNIT	
IC704	MSC1198SS	IC	
Q701	2SC4081(RS)	TRANSISTOR	
Q706	2SC4081(RS)	TRANSISTOR	
Q709	DTC124EU	TRANSISTOR	
Q751	DTC124EU	TRANSISTOR	
Q752	DTC124EU	TRANSISTOR	
Q753	DTC124EU	TRANSISTOR	
Q754	DTA124EU	TRANSISTOR	
Q760	DTA124ES	TRANSISTOR	

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
D701	DAP202U	DIODE	
D702	11ES2	DIODE	
D703	LTZ-MR15	DIODE	
D704	DAP202U	DIODE	
D705	UZ9.1BSB	ZENER DIODE	
	or RD9.1ES-T1B2	ZENER DIODE	
	or HZS9.1EB2TJ	ZENER DIODE	
D706	DAP202U	DIODE	
D707	11ES2	DIODE	
D708	DAP202U	DIODE	
D709	DAP202U	DIODE	
D710	DAP202U	DIODE	
D711	DAP202U	DIODE	
D712	DAP202U	DIODE	
D714	DAP202U	DIODE	
D715	DAP202U	DIODE	
D716	DAP202U	DIODE	
D717	DAP202U	DIODE	
D718	DAP202U	DIODE	
D721	DAP202U	DIODE	
D723	DAP202U	DIODE	
D730	1SS133	DIODE	
D771	SLH-34VC3F	LE DIODE	
D772	SLH-34MC3F	LE DIODE	
D775	SLH-34MC3F	LE DIODE	
D777	SLH-34VC3F	LE DIODE	
R701	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
R702	QRSA08J-123YN	RESISTOR	12KΩ,1/10W
R703	QRSA08J-104	RESISTOR	100KΩ,1/10W
R704	QRSA08J-682	RESISTOR	6.8KΩ,1/10W
R705	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R706	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R707	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R708	QRSA08J-224YN	RESISTOR	220KΩ,1/10W
R709	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R710	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R711	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R712	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R714	QRSA08J-271YN	RESISTOR	270Ω,1/10W
R715	QRSA08J-271YN	RESISTOR	270Ω,1/10W
R717	QRSA08J-105YN	RESISTOR	1MΩ,1/10W
R725	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R726	QRSA08J-102	RESISTOR	1KΩ,1/10W
R727	QRSA08J-102	RESISTOR	1KΩ,1/10W
R728	QRSA08J-102	RESISTOR	1KΩ,1/10W
R729	QRSA08J-271YN	RESISTOR	270Ω,1/10W
R730	QRSA08J-151YN	RESISTOR	150Ω,1/10W
R731	QRSA08J-104	RESISTOR	100KΩ,1/10W
R732	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R733	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R734	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R735	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R736	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R737	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R738	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R739	QRSA08J-102	RESISTOR	1KΩ,1/10W
R740	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R741	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R742	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R743	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R744	QRSA08J-272YN	RESISTOR	2.7KΩ,1/10W
R745	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R746	QRSA08J-471YN	RESISTOR	470Ω,1/10W
R747	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R749	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
R756	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R757	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R758	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R759	QRSA08J-153	RESISTOR	15KΩ,1/10W
R761	QRSA08J-104	RESISTOR	100KΩ,1/10W
R765	QRSA08J-104	RESISTOR	100KΩ,1/10W
R768	QRSA08J-331YN	RESISTOR	330Ω,1/10W
R769	QRSA08J-223YN	RESISTOR	22KΩ,1/10W
R770	QRSA08J-472	RESISTOR	4.7KΩ,1/10W
R771	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
R772	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
R773	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
R774	QRSA08J-333YN	RESISTOR	33KΩ,1/10W
R775	QRSA08J-104	RESISTOR	100KΩ,1/10W
RA702	QRB147J-104	NETWORK RESISTOR	100KΩ,1/4W
	or QRB149J-104	NETWORK RESISTOR	100KΩ,1/4W
RA703	QRB117J-104	NETWORK RESISTOR	100KΩ
	or QRB119J-104	NETWORK RESISTOR	100KΩ
C701	QEK60JM-107	E CAPACITOR	100μF,6.3V
C702	QEK61CM-226	E CAPACITOR	22μF,16V
C703	QEA40HZ-104	E CAPACITOR (DOUBLE)	0.1μF,5.5V
	or QEA40HZ-104A	E CAPACITOR (DOUBLE)	0.1μF,5.5V
C704	QEK61CM-106	E CAPACITOR	10μF,16V
C705	QCFA1HZ-102	CAPACITOR	0.001μF,50V
C706	QCFA1HZ-473	CAPACITOR	0.047μF,50V
C707	QCFA1HZ-473	CAPACITOR	0.047μF,50V
C710	QCSA1HJ-101	CAPACITOR	100PF,50V
C711	QCSA1HJ-101	CAPACITOR	100PF,50V
C712	QAT3123-200	TRIMMER CAPACITOR,TIMER CLOCK-	20PF
C713	QCTA1CH-100	CAPACITOR	10PF,16V
C714	QCSA1HJ-560	CAPACITOR	56PF,50V
C715	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C716	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C751	QEK61CM-106	E CAPACITOR	10μF,16V
C752	QEP61CM-226	E CAPACITOR	22μF,16V
C753	QEP61CM-226	E CAPACITOR	22μF,16V
C754	QFN31HJ-223	M CAPACITOR	0.022μF,50V
C755	QFN31HJ-223	M CAPACITOR	0.022μF,50V
C758	QER40JM-107	E CAPACITOR	100μF,6.3V

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
C759	QCFA1HZ-103	CAPACITOR	0.01µF,50V
C760	QCFA1HZ-103	CAPACITOR	0.01µF,50V
C762	QEK61VM-226	E CAPACITOR	22µF,35V
C767	QER61HM-106	E CAPACITOR	10µF,50V
L701	PU48530-101J	COIL	100µH
L751	PU48530-101J	COIL	100µH
⚠ X701	PU61013	CRYSTAL RESONATOR	
S702	PU60392-2Z	TACT SWITCH	
S703	PU60392-Z	TACT SWITCH	
S704	PU60392-Z	TACT SWITCH	
S705	PU60392-Z	TACT SWITCH	
S706	PU60392-Z	TACT SWITCH	
S707	PU60392-2Z	TACT SWITCH	
S708	PU60392-2Z	TACT SWITCH	
S715	PU60392-Z	TACT SWITCH	
S716	PU60392-Z	TACT SWITCH	
S718	PU60392-Z	TACT SWITCH	
S719	PU60392-Z	TACT SWITCH	
S720	PU60392-Z	TACT SWITCH	
S721	PU60392-Z	TACT SWITCH	
S722	PU60392-Z	TACT SWITCH	
S723	PU60392-Z	TACT SWITCH	
S724	PU60392-Z	TACT SWITCH	
S727	PU60392-Z	TACT SWITCH	
S729	PU60392-Z	TACT SWITCH	
S730	PU60392-Z	TACT SWITCH	
S732	PU60392-Z	TACT SWITCH	
S741	PU60392-Z	TACT SWITCH	
S781	PU59292	SLIDE SWITCH	
S782	PU59292	SLIDE SWITCH	
FDP701	PU61084-2	FLUORESCENT DISPLAY PANEL	
HD701	PQ32933-1-1	FDP HOLDER(L)	
HD702	PQ32934-1-1	FDP HOLDER(R)	
HD703	PQ43994	LED HOLDER	
CN701	PU61044-6	WIRE TRAP	
CN702	PU58844-2	CAP HOUSING	
CN703	PU59555-10	CAP HOUSING	

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION
CN704	PU59555-7	CAP HOUSING
CN705	PU61044-9	WIRE TRAP

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JACK BOARD ASSEMBLY <36>

PWBA6	PB10447A6	JACK BOARD ASSY
JA8	PU61200	PIN JACK
CN251	PU58844-2	CAP HOUSING

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SW/JACK BOARD ASSEMBLY <37>

PWBA3	PB10447A3-01	SW/JACK BOARD ASSY	
Q752	DTC144WS	TRANSISTOR	
D778	SLH-34VC3F	LE DIODE	
R769	QRD161J-331	RESISTOR	330Ω,1/6W
R781	QRD161J-103	RESISTOR	10KΩ,1/6W
R782	PU61127	V RESISTOR	
R783	PU61016	V RESISTOR	
R784	PU60652	SLIDE VR	
S701	PU60392-2Z	TACT SWITCH	
HD704	PQ40795-1-2	LED HOLDER	

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION
JA701	PU60586	JACK BOARD ASSY
JA702	PU60659	MINI JACK
JA703	PU60664-3	MINI JACK
JA704	PU60452-2	MINI JACK
CN751	PU59555-6	CAP HOUSING
CN752	PU59555-5	CAP HOUSING
CN753	PU59555-3	CAP HOUSING
CN754	PU58844-3	CAP HOUSING
CN755	PU59555-5	CAP HOUSING
CN756	PU58844-4	CAP HOUSING
CN757	PU58844-6	CAP HOUSING

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PRE/REC AMP BOARD ASSEMBLY <43>

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION
PWBA	PB10330B	PRE/REC BOARD ASSY
IC1	AN3380NK	IC
IC201	AN3386NK-A	IC
Q1	DTC124TU	TRANSISTOR
Q2	DTC124TU	TRANSISTOR
Q4	2SC4081(QRS)	TRANSISTOR
Q5	DTC124TU	TRANSISTOR
Q201	2SA1576(QRS)	TRANSISTOR
Q202	2SC4081(QRS)	TRANSISTOR
Q203	2SC4081(QRS)	TRANSISTOR
Q204	DTC144WU	TRANSISTOR
Q205	DTC144WU	TRANSISTOR
Q206	DTC144WU	TRANSISTOR
D1	1SS133	DIODE
	or MA165	DIODE
D2	1SS133	DIODE
	or MA165	DIODE
D201	1SS133	DIODE
	or MA165	DIODE
D202	1SS133	DIODE
	or MA165	DIODE
D203	MA141K	DIODE

#⚠ REF No.	PART No.	PART NAME, DESCRIPTION	
R1	QRSA08J-243YN	RESISTOR	24KΩ,1/10W
R2	QRSA08J-101YN	RESISTOR	100Ω,1/10W
R3	QRSA08J-101YN	RESISTOR	100Ω,1/10W
R4	QRSA08J-274YN	RESISTOR	270KΩ,1/10W
R5	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
R6	QRSA08J-332YN	RESISTOR	3.3KΩ,1/10W
R7	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
R8	QRSA08J-332YN	RESISTOR	3.3KΩ,1/10W
R9	QRSA08J-153YN	RESISTOR	15KΩ,1/10W
R10	QRSA08J-223YN	RESISTOR	22KΩ,1/10W
R11	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R12	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
R13	QRSA08J-681YN	RESISTOR	680Ω,1/10W
R14	QRSA08J-560YN	RESISTOR	56Ω,1/10W
R15	QRSA08J-560YN	RESISTOR	56Ω,1/10W
R201	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
R202	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
R203	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
R204	QRSA08J-391YN	RESISTOR	390Ω,1/10W
R205	QRSA08J-391YN	RESISTOR	390Ω,1/10W
R206	QRSA08J-821YN	RESISTOR	820Ω,1/10W
R207	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
R208	QRSA08J-222YN	RESISTOR	2.2KΩ,1/10W
R209	QRSA08J-471YN	RESISTOR	470Ω,1/10W
R210	QRSA08J-681YN	RESISTOR	680Ω,1/10W
R211	QRSA08J-561YN	RESISTOR	560Ω,1/10W
R212	QRSA08J-821YN	RESISTOR	820Ω,1/10W
R213	QRSA08J-102YN	RESISTOR	1KΩ,1/10W
R214	QRSA08J-122YN	RESISTOR	1.2KΩ,1/10W
R215	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
R216	QRSA08J-153YN	RESISTOR	15KΩ,1/10W
R217	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
R218	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
R219	QRSA08J-334YN	RESISTOR	330KΩ,1/10W
R220	QRSA08J-103YN	RESISTOR	10KΩ,1/10W
R221	QRSA08J-393YN	RESISTOR	39KΩ,1/10W
R222	QRSA08J-153YN	RESISTOR	15KΩ,1/10W
R223	NRVA02D-4872AY	RESISTOR	48.7KΩ,1/10W
R224	QRSA08J-474YN	RESISTOR	470KΩ,1/10W
R225	QRSA08J-562YN	RESISTOR	5.6KΩ,1/10W
R226	QRSA08J-431YN	RESISTOR	430Ω,1/10W
R227	QRSA08J-471YN	RESISTOR	470Ω,1/10W
R228	QRSA08J-331YN	RESISTOR	330Ω,1/10W
R229	QRSA08J-331YN	RESISTOR	330Ω,1/10W
R230	QRSA08J-104YN	RESISTOR	100KΩ,1/10W
R231	QRS188J-474YN	RESISTOR	470KΩ,1/8W
C1	QER61HM-104	E CAPACITOR	0.1μF,50V
C2	QCSA1HJ-391	CAPACITOR	390PF,50V
C3	QCSA1HJ-102	CAPACITOR	0.001μF,50V
C4	QCSA1HJ-102	CAPACITOR	0.001μF,50V
C5	QCSA1HJ-102	CAPACITOR	0.001μF,50V
C6	QCSA1HJ-102	CAPACITOR	0.001μF,50V
C7	QCFA1CZ-224	CAPACITOR	0.22μF,16V
C8	QCSA1HJ-391	CAPACITOR	390PF,50V

#△ REF No.	PART No.	PART NAME, DESCRIPTION	
C9	QER60JM-107	E CAPACITOR	100μF,6.3V
C10	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C11	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C12	QCFA1CZ-224	CAPACITOR	0.22μF,16V
C14	QCSA1HJ-330	CAPACITOR	33PF,50V
C15	QCSA1HJ-331	CAPACITOR	330PF,50V
C16	QCSA1HJ-151	CAPACITOR	150PF,50V
C17	QCSA1HJ-102	CAPACITOR	0.001μF,50V
C18	QCSA1HJ-102	CAPACITOR	0.001μF,50V
C19	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C201	QER60JM-476	E CAPACITOR	47μF,6.3V
C202	QCFA1HZ-473	CAPACITOR	0.047μF,50V
C203	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C204	QCSB1HK-4R7	CAPACITOR	4.7PF,50V
C205	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C207	QCSA1HJ-360	CAPACITOR	36PF,50V
C208	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C209	QCSA1HJ-101	CAPACITOR	100PF,50V
C210	QCSA1HJ-331	CAPACITOR	330PF,50V
C211	QCSA1HJ-680	CAPACITOR	68PF,50V
C212	QCSA1HJ-101	CAPACITOR	100PF,50V
C213	QCFA1EZ-104	CAPACITOR	0.1μF,25V
C214	QCSA1HJ-391	CAPACITOR	390PF,50V
C216	QER61CM-476	E CAPACITOR	47μF,16V
C217	QCFA1EZ-104	CAPACITOR	0.1μF,25V
C218	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C219	QCFA1EZ-104	CAPACITOR	0.1μF,25V
C220	QCSA1HJ-221	CAPACITOR	220PF,50V
C221	QCSA1HJ-271	CAPACITOR	270PF,50V
C222	QCSA1HJ-151	CAPACITOR	150PF,50V
C223	QCSA1HJ-151	CAPACITOR	150PF,50V
C224	QCY81EK-104	CAPACITOR	0.1μF,25V
C225	QCY81EK-104	CAPACITOR	0.1μF,25V
C226	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C227	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C228	QCY81EK-104	CAPACITOR	0.1μF,25V
C229	QCY81EK-104	CAPACITOR	0.1μF,25V
C230	QER61AM-685	E CAPACITOR	6.8μF,10V
C231	QCF81EZ-224	CAPACITOR	0.22μF,25V
C232	QCFA1HZ-103	CAPACITOR	0.01μF,50V
C233	QCVB1CN-103	CAPACITOR	0.01μF,16V
L1	PU54223-101K	COIL	100μH
L2	PU53223-221J	COIL	220μH
L201	PU54223-101K	COIL	100μH
L202	PU59988-270JY	COIL	27μH
L203	PU59988-330JY	COIL	33μH
L204	PU59988-560JY	COIL	56μH
L205	PU59988-100JY	COIL	10μH
L206	PU59988-181JY	COIL	180μH
L207	PU59988-180JY	COIL	18μH
L208	PU54223-470K	COIL	47μH

#△ REF No.	PART No.	PART NAME, DESCRIPTION
SLD201	PQ33001-1-1	SHIELD CASE(1)
CN1	PU58844-104	CAP HOUSING
CN201	PU59555-108	CAP HOUSING
CN202	PU58844-106	CAP HOUSING
CN203	PU59974-13	CAP HOUSING
CN205	PU58844-3	CAP HOUSING

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FLYING ERASE BOARD ASSEMBLY <46>

PWBA	PB30104A	F.E BOARD ASSY	
Q1	2SA933S	TRANSISTOR	
Q2	2SC1741S(QR)	TRANSISTOR	
Q3	2SA933S(Q)	TRANSISTOR	
Q4	2SD639R	TRANSISTOR	
Q5	2SD639R	TRANSISTOR	
D1	UZ8.2BSC	ZENER DIODE	
D2	1SS133	DIODE	
	or MA165	DIODE	
R1	QRD161J-473	RESISTOR	47KΩ,1/6W
R2	QRD161J-472	RESISTOR	4.7KΩ,1/6W
R3	QRD161J-222	RESISTOR	2.2KΩ,1/6W
R4	QRD161J-473	RESISTOR	47KΩ,1/6W
R5	QRD161J-223	RESISTOR	22KΩ,1/6W
R6	QRD161J-104	RESISTOR	100KΩ,1/6W
R7	QRD161J-121	RESISTOR	120Ω,1/6W
R8	QRD161J-104	RESISTOR	100KΩ,1/6W
R9	QRD161J-121	RESISTOR	120Ω,1/6W
R10	QRD161J-101	RESISTOR	100Ω,1/6W
C1	QCVB1CN-103	CAPACITOR	0.01μF,16V
C2	QCC11EJ-123	CAPACITOR	0.012μF,25V
C3	QCSB1HJ-560	CAPACITOR	56PF,50V
C4	QCBB1HJ-820	CAPACITOR	82PF,50V
C6	QCBB1HJ-820	CAPACITOR	82PF,50V
C8	QCT25UJ-181	CAPACITOR	180PF
C9	QCT25UJ-330	CAPACITOR	33PF

# ⚠	REF No.	PART No.	PART NAME, DESCRIPTION	
	L1	PU48530-560J	COIL	56μH
	L2	PU48530-3R3K	COIL	3.3μH
	L3	PU48530-3R3K	COIL	3.3μH
	L4	PU59152-101J	COIL	100μH
⚠	T1	PU56175	S.TRANS	
	SLD1	PU61041	SHIELD CASE	
	SLD2	PU61042	SHIELD COVER	
	SLD3	PU61043	SHIELD PLATE	
	CN1	PU58844-3	CAP HOUSING	
	CN2	PU60417-104	CAP HOUSING	

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DECK TERMINAL BOARD ASSEMBLY <51>

	PWBA	PB10320A-02	DECK TERM. BOARD ASSEMBLY	
	Q1	PU60625	END SENSOR	
	R1	QRD161J-202	RESISTOR	2KΩ,1/6W
	R3	QRD161J-331	RESISTOR	330Ω,1/6W
	R4	QRD161J-331	RESISTOR	330Ω,1/6W
	R5	QRD161J-331	RESISTOR	330Ω,1/6W
	R7	QRD161J-202	RESISTOR	2KΩ,1/6W
	R8	NTH5D473KB	THERMISTOR	
		or ERT-D2ZHK473S	NEGA THERMISTOR	
	C1	QCVB1CM-103	CAPACITOR	0.01μF,16V
	PHS1	PS5705HR	PH INTERRUPTER(TU REEL)	
	PHS2	PS5705HR	PH INTERRUPTER(SUP REEL)	
	CN1	PEMC0722-017	WIRE TRAP	
		or PEMC0753-017	WIRE TRAP	
	CN2	PU60642	CONNECTOR,(7PIN)	
	CN3	PU60640	CONNECTOR,(4PIN)	

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LOARDING MDA BOARD ASSEMBLY <55>

# ⚠	REF No.	PART No.	PART NAME, DESCRIPTION	
	PWBA2	PB10320A2-01	LOADING MDA BOARD ASSY	
⚠	IC1	BA6418N	IC	
⚠		or XRA6418N	IC	
	C1	QETA1CM-336	E CAPACITOR	33μF,16V
	CN1	PU59555-104	CAP HOUSING	

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CASSETTE HOUSING BOARD <56>

	PWB1	PB40041-01-01	CASSETTE HOUSING BOARD	
	Q2	PN268VI-NC	PHOTO TRANSISTOR	
	C1	QCC11EJ-103	CAPACITOR	0.01μF,25V
	PHS3	PU60629	CASS.SENSOR	
	CN2	PU60639	CONNECTOR(4PIN)	

#△ REF No.	PART No.	PART NAME, DESCRIPTION	

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UPPER DRUM BOARD <62><63> <62>

PWB1	PDM3161	BOARD (UPPER DRUM),X2	

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AUTO TRACKING BOARD ASSEMBLY <83>

PWBA4	PB10447A4-01	AT BOARD ASSY	
IC451	BA7039	IC	
	or XRA7039	IC	
D452	1SS133	DIODE	
	or MA165	DIODE	
R451	QRD161J-102	RESISTOR	1KΩ,1/6W
R452	QRD161J-152	RESISTOR	1.5KΩ,1/6W
R453	QRD161J-152	RESISTOR	1.5KΩ,1/6W
R455	QRD161J-103	RESISTOR	10KΩ,1/6W
R456	QRD161J-102	RESISTOR	1KΩ,1/6W
R458	QRD161J-124	RESISTOR	120KΩ,1/6W
R459	QRD161J-681	RESISTOR	680Ω,1/6W
R460	QRD161J-472	RESISTOR	4.7KΩ,1/6W
R461	QRD161J-472	RESISTOR	4.7KΩ,1/6W
C451	QCVB1CN-103	CAPACITOR	0.01μF,16V
C452	QCVB1CN-103	CAPACITOR	0.01μF,16V
C453	QCVB1CN-103	CAPACITOR	0.01μF,16V
C454	QFV71HJ-104	TF CAPACITOR	0.1μF,50V
	or QFN31HJ-104	M CAPACITOR	0.1μF,50V
C455	QCVB1CN-103	CAPACITOR	0.01μF,16V
C456	QFV71HJ-104	TF CAPACITOR	0.1μF,50V
	or QFN31HJ-104	M CAPACITOR	0.1μF,50V
C457	QCVB1CN-103	CAPACITOR	0.01μF,16V
C458	QEK61AM-226	E CAPACITOR	22μF,10V
C459	QCVB1CN-103	CAPACITOR	0.01μF,16V
L451	PU59152-270J	COIL	27μH

SECTION 6
TECHNICAL INFORMATIONS

6.1 CPU PIN FUNCTIONS

1. Mechacon CPU pin function (IC601)

Pin No.	Symbol	I/O format	Label	IN/OUT	Contents
1	Vcc	–	Vcc	–	for the system control, DC 5 V
2	VREF	–	Vref		
3	DA	Analog	AFC	I	TUNING DETECT DATA
4	PWM	PWM	AVG FM	I	AUTO TRACKING DATA (AVERAGE FM)
5	Port 6 4	N-ch OPEN DRAIN	P PAUSE	I	REMOTE PAUSE CONTROL (PAUSE ON: L)
6	3		PREROLL	O	PREROLL FUNCTION CONTROL
7	2		THERM	I	THERMIC CORRECTION (CAPSTAN BREAK TIMING CONTROL)
8	1		MODE SENS B	I	MECHANISM MODE DETECT
9	0		MODE SENS A		
10	AN 7	Analog	MODE SENS C		
11	6		REC SAFETY	I	DETECTS ERASE PROTECT TAB (TAB ABSENT: H)
12	5		START SENS	I	START SENSOR, READER TAPE DETECT (ON: L)
13	4		DRUM CTL V	O	DRUM MOTOR DRIVE VOLTAGE SERVO
14	Port 4 3	N-ch OPEN DRAIN	CAP CTL V	O	CAPSTAN MOTOR DRIVE VOLTAGE SERVO
15	2		CASS SENS	I	CASSETTE SENSOR (CASS IN _⎍_)
16	1		END SENS	I	END SENSOR, TRAILER TAPE DETECT (ON: L)
17	0		D FF	I	DRUM FF, REC TIMING CONTROL/DRUM ROTATION DETECT
18	Port 3 7	N-ch OPEN DRAIN	CTL PULSE	I	MODE (SP/EP/LP) DETECT/BLANK DETECT
19	6		X11	O	CAPSTAN SPEED CONTROL (X11 MODE: H)
20	5		V PULSE	O	V PULSE OUTPUT (SPECIAL PLAYBACK)
21	4		A/M/S	O	HEAD SELECT SIGNAL OUTPUT
22	3		NC	–	NC
23	2		NC		
24	1		SUP FG	I	REEL ROTATION DETECT/TAPE REMAIN DATA
25	0		TU FG		
26	INT-1		CAP FG	I	MODE (SP/EP/LP) DETECT/BACK SPACE COUNT
27	CN Vss		CN Vss		(ALWAYS) GND
28	$\overline{\text{RESET}}$		RESET		RESET AT CONNECT VCR TO AC
29	X IN		X IN	I	MAIN SYSTEM CLOCK (4 MHz)
30	X OUT		X OUT	O	
31	φ		NC	–	NC
32			Vss	–	GND
33	Port 5 7	with Input Latch	DO CTL	I	DOC MUTE (FM A DETECT)
34	6		REC START	O	REC START: L
35	5		Hi-Fi REC ST	O	Hi-Fi AUDIO REC START: L
36	4		AUX	O	INPUT SIGNAL SELECT, AUX: L
37	3	High impedance	FE H CTL	O	FLYING ERASE HEAD CONTROL
38	2		P MUTE	O	PICTURE MUTE CONTROL: L
39	1		EE		EE MODE: L
40	0		A MUTE		AUDIO MUTE CONTROL: H
41	Port 1 7	N-ch OPEN DRAIN	FULL ERASE	O	FULL ERASE ON: H
42	6		V REC	O	REC MODE: H
43	5		P CTL		POWER CONTROL (P ON: H)
44	4		A. DUB	O	AUDIO DUBBING: L
45	3		A. REC		AUDIO REC: L
46	2		A. EE		AUDIO EE: L
47	1		FADE		FADER ON: L
48	0		SP		SP MODE: H
49	Port 0 7	N-ch OPEN DRAIN	MON SEL	O	AUDIO MONITOR SELECT (Hi-Fi/NORM/MIX)
50	6		CH SEL		AUDIO CHANNEL SELECT (L/ST/R)
51	5		LP	O	LP MODE: L
52	4		NC	–	NC
53	3		PLL LOCK	I	TUNING DATA OUTPUT CHECK
54	2		PLL DATA	O	PLL TUNING DATA (18-bit)
55	1		S CLOCK	O	CLOCK (COMMON)
56	0		S DATA	O	SERVO IC CONTROL DATA
57	Port 2 7	C MOS	SYNC DET	I	SYNC DETECT (NO SIGNAL: H)
58	6		INDEX	1/O	INDEX DATA WRITE/READ CONTROL (VISS) (ON:L)
59	5		VIDEO	O	VIDEO MODE: L
60	4		PAUSE	O	CAPSTAN MOTOR SERVO
61	3		SERVO	O	CAPSTAN MOTOR SERVO
62	2		T CLK	I	CLOCK (TM bus)
63	1		T DATA	I/O	TM (TIMER/M-CTL CPU) bus DATA (16-bit)
64	0		CAP REV	O	REV MODE: L

Table 6-1-1 Mechacon CPU pin function

2. Timer CPU pin function (IC701)

Pin No.	Symbol	Label	I/O	Contents
1	D11/FS4	Se	O	SEGMENT DISPLAY DATA/KEY SCAN PULSE OUTPUT
2	D12/FS3	Sd		
3	D13/FS2	Sc	O	SEGMENT DISPLAY DATA OUTPUT
4	D14/FS1	Sb	O	SEGMENT DISPLAY DATA/KEY SCAN PULSE OUTPUT
5	D15/FS0	Sa		
6	R00/FD0	11G	O	COLUMN DISPLAY DATA
7	R01/FD1	10G		
8	R02/FD2	9G		
9	R03/FD3	8G		
10	R10/FD4	7G		
11	R11/FD5	6G		
12	R12/FD6	5G		
13	R13/FD7	4G		
14	R20/FD8	3G		
15	R21/FD9	2G		
16	R22/FD10	1G		
17	RF23/FD11	GRID END	I	LIGHTING DATA OUTPUT CHECK
18	RA0	TEST	I	TEST POINT (CLOCK ADJUST)
19	RA1	POWER DOWN	I	POWER DOWN DETECT
20	R30/FD12	IND ON	O	LEVEL IND CONTROL (IND ON: L)
21	R31/FD13	DIM	O	DIMMER CONTROL (DIMINUTION: L)
22	R32/FD14	POWER	O	LED CTL (LED ON: H)
23	R33/FD15	AUTO TK		
24	R50	JS A	I	JOG PULSE INPUT (A)
25	R51	STILL		SHUTTLE SW (H: NO OPERATION)
26	R52	JS B		JOG PULSE INPUT (B)
27	R53	SAP REC	O	SAP REC LED CONTROL (LED ON: H)
28	R60/INT0	11G END	I	COLUMN DISPLAY DATA
29	R61/INT2	CNT PULSE	I	LINEAR TIME COUNTER DATA
30	R62/INT2	REMOTE	I	REMOTE DATA INPUT (A/B CODE)
31	R63/INT3	SYNC DET		SYNC L/H FROM ON SCREEN (NO SIGNAL: H)
32	Vcc	Vcc	–	for SYSTEM CTL (MAIN POWER)
33	R40/SCK	OS-CLK	O	MEMORY DATA/ON SCREEN DATA
34	R41/SI	CS	O	
35	R42/SO	DS-DATA	I/O	
36	R43/PWM	PROG	O	PROGRAM MODE: H
37	R70/BUZZ	NC	–	NC
38	R71	TM CLK	O	TM (Timer CPU/M-CTL CPU) bus 16-bit SERIAL DATA
39	R72	TM DATA IN	I	
40	R73	TM DATA OUT	O	
41	R80	OS RESET	O	ON SCREEN IC CONTROL
42	R81	OS CE		
43	R90	KS 0	I	KEY SCAN DATA INPUT
44	R91	KS 1		
45	R92	KS 2		
46	R93	KS 3		
47	RESET	RESET	I	RESET AT CONNECT VCR TO AC
48	OSC 2	OSC 2	I	MAIN SYSTEM CLOCK (4.19 MHz)
49	OSC 1	OSC 1	O	
50	GND	GND	–	GND
51	CL 1	CL 1	I	
52	CL 2	NC	–	NC
53	TEST	+5	I	ALWAYS 5 V LEVEL
54	D0/FS15	Sp	O	SEGMENT DISPLAY DATA OUTPUT
55	D1/FS14	So		
56	D2/FS13	Sn		
57	D3/FS12	Sm	O	SEGMENT DISPLAY DATA/KEY SCAN PULSE OUTPUT
58	D4/FS11	Sl	O	SEGMENT DISPLAY DATA OUTPUT
59	D5/FS10	Sk	O	SEGMENT DISPLAY DATA/KEY SCAN PULSE OUTPUT
60	D6/FS9	Sj	O	SEGMENT DISPLAY DATA OUTPUT
61	D7/FS8	Si		
62	D8/FS7	Sh	O	SEGMENT DISPLAY DATA/KEY SCAN PULSE OUTPUT
63	D9/FS6	Sg		
64	D10/FS5	Sf		

Table 6-1-2 Timer CPU pin function

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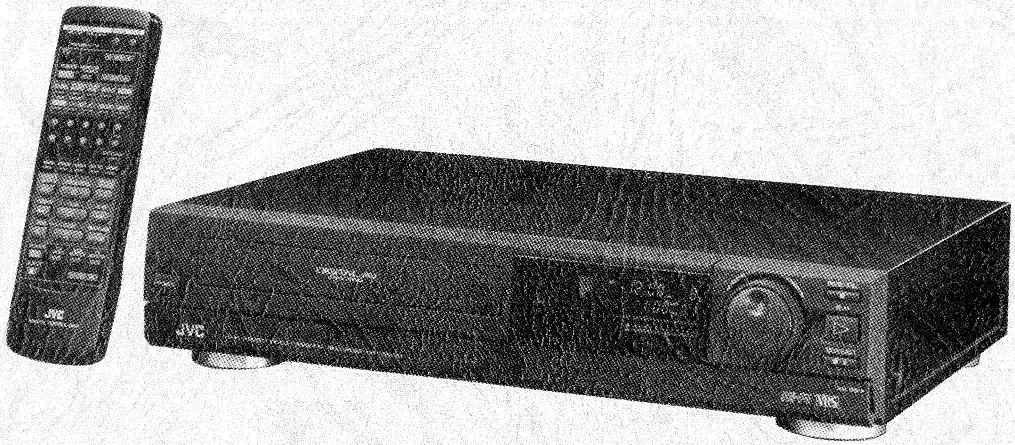
JVC

VIDEO TECHNICAL GUIDE

Hi-Fi STEREO VIDEO CASSETTE RECORDER

HR-D960/D970 NTSC



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SECTION 1

GENERAL DESCRIPTION

For an outline of VHS, refer to the VHS Composite Technical Guide (No. T-8029).

SECTION 2
MECHANISM DESCRIPTION

These models now have new mechanisms.

2.1 OVERVIEW

The following three motors are used in the new mechanism.

- Drum motor
- Capstan motor
- Loading motor

These motors are controlled either by the mechanism controller or the servo circuit.

2.1.1. Drum motor (direct drive)

This motor drives the upper drum where the rotary head is mounted. The motor is turned on and off by the mechanism controller and the speed and phase are servo controlled.

2.1.2 Capstan motor (direct drive)

When loading is completed, this motor works together with the pinch roller to transport the tape. This motor also drives the reel disk via a belt for tape takeup.

The motor is turned on and off, and forward and reverse operation is switched by the mechanism controller. The speed and phase are servo controlled.

2.1.3 Loading motor (belt drive)

This motor drives the control cam, switches the loading/unloading operations and also the mechanism modes. The power from this motor is transmitted to the cassette housing via the worm pulley slide gear to load and unload cassettes.

The motor is turned on and off, and forward and reverse operation is switched by the mechanism controller.

2.2 MECHANISM PARTS

While reading, identify the various modes by color and then confirm.

2.2.1 Worm clutch assembly

The worm clutch assembly consists of the pulley, slide gear, worm gear and windmill.

1. The slide gear transmits the power from the loading motor to the cassette housing. This gear is turned on and off by the cancel lever to start or stop the transmission of motor power to the cassette housing.
2. The worm gear transmits the power from the loading motor to the control cam via the worm.
3. The windmill is rotated by the loading motor and releases the slide plate lock by operating the lock lever.

   (Windmill is included with the worm clutch assembly)

2.2.2 Control cam

The power from the loading motor is transmitted to the control cam by the worm gear. The control cam then controls the half-loading arm/guide arm, pinch roller and plate assembly.

2.2.3 Half-loading arm/guide arm

1. The half-loading arm is rotated clockwise by the counterclockwise rotation of the control cam to load the video tape.
2. The guide arm is rotated counterclockwise by the clockwise rotation of the half-loading arm to load the video tape.

2.2.4 Pinch roller

The pinch roller is part of the pinch roller arm assembly. This pinch roller arm assembly is operated by the pinch roller press lever and pinch roller cam.

1. The pinch roller cam consists of the gear which meshes with the control cam and the worm slot which moves the pinch roller press lever up and down.
2. The pinch roller press lever moves up and down along the worm slot in the pinch roller cam to regulate the operation of the pinch roller arm assembly. After droping down, the pin of the pinch roller lever enters the slot in the control cam, is pushed along the control cam slot by the counterclockwise rotation of the control cam and presses the pinch roller against the capstan.

2.2.5 Plate assembly

The plate assembly consists of the control plate, slide plate and lock lever and controls the loading arm assembly, tension arm, main brake, tension band brake, takeup subbrake, cancel lever assembly and change lever assembly.

1. The control plate converts the rotary motion of the control cam to reciprocal lateral motion by means of the linear rack gear. All parts except the loading arm assembly are controlled by this reciprocal lateral motion. The gear of the loading arm assembly meshes with the other linear rack gear of the control plate and converts the reciprocal lateral motion back into rotary motion.

2.3 OUTLINE

A full loading system is used for the mechanism of this model. The system features fast response when changing mechanism modes.

In previous systems, several seconds were needed in the mode shift from Stop to Play. But in the full loading system, a playback picture output is obtained in about 1 second. As can be noted from the figure, the full loading mechanism is essentially the same as the previously introduced "half loading" mechanism. The differing points are compared in the following pages.

2.3.1 Comparisons

1. Slide encoder (mode switch)
   Two switches were used for detecting mechanism modes in previous models. A third switch is added to this model for detecting half loading and full loading Stop modes.
2. Removal of Capstan Brake
   The capstan brake was removed and a tension brake was added by changing the conventional V-belt into a gear belt (timing belt). This is to speedup the mode shift response (for example, from S-REW to S-FF).
   The revolution of the capstan motor is transferred by the timing belt to the center pulley assembly. This timing belt's gear meshes with the gear mounted on the capstan motor, and is also designed to mesh with the center pulley's gear, so the capstan motor's revolution will be transmitted immediately and accurately to the center pulley without slipping and without any loss of revolution. The timing belt's tension is adjusted with the tension pulley.
3. Change to Two-Stage Reel Clutch (Idler Gear)
   Changing to the two-stage gear ratio enables high-speed winding. However, when the load is large at time of starting and at the tape end, the capstan motor's drive voltage is controlled to alleviate the impact.
4. Strengthening of Pinch Roller Arm and Changing of Pinch Roller Press Lever Shape
   The pinch roller will be actuated frequently to enable rapid shifting to the modes of the respective mechanisms, so the pinch roller arm was strengthened and the shape of the pinch roller press lever changed.
5. Change of Control Cam Shape
   The shape of the control cam's groves was changed to enable the pinch roller to be switched to OFF for a short period of time during the PAUSE mode (when switching from S-FF to S-REV).
6. Addition of SUP-REEL SENSOR
   This is to enable display (computing) of remaining tape volume.
7. Addition of Stabilizer on Impedance Roller
   This has been added to supress jittering.

2.4 MAIN MECHANISM PARTS

2.4.1 Full loading

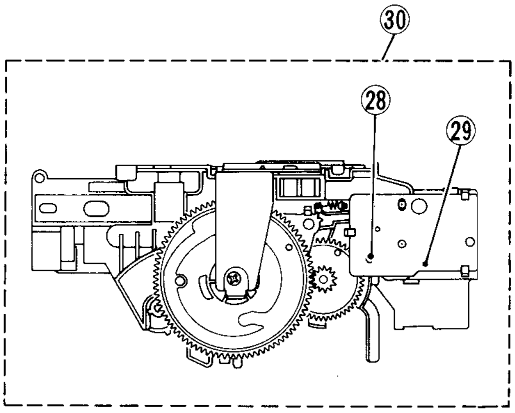


Fig. 2-4-1 Side view of cassette housing

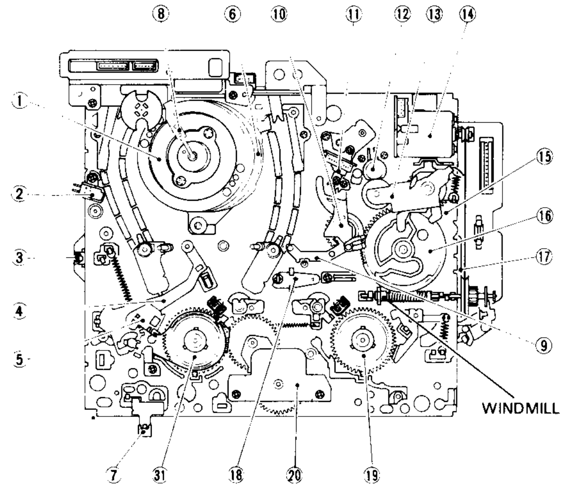


Fig. 2-4-2 Top view of main-deck

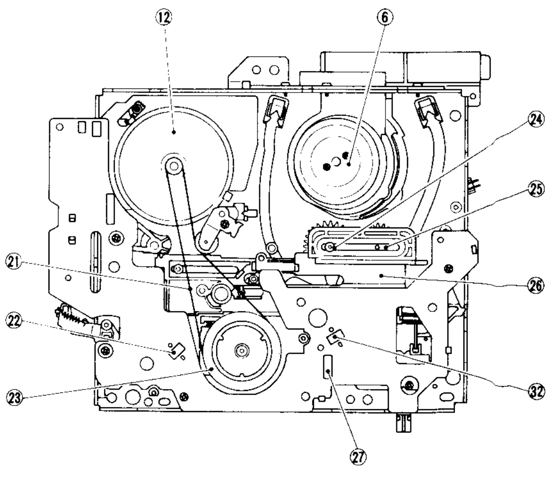


Fig. 2-4-3 Bottom view of main-deck

No.	Parts Name	No.	Parts Name	No.	Parts Name
1	Upper drum assy	12	Capstan motor	23	Clutch assy
2	Full erase head	13	Pinch roller arm assy	24	Take-up loading arm assy
3	End sensor	14	Loading motor assy	25	Supply loading arm assy
4	Tension arm assy	15	Pinch roller cam	26	Plate assy
5	Tension band assy	16	Control cam	27	Slide switch
6	Lower drum motor assy	17	Loading belt	28	Start sensor
7	REC safety switch	18	LED holder	29	Cassette sensor
8	Brush assy	19	Reel disk (take-up)	30	Cassette housing assy
9	Half loading gear assy	20	Idler gear assy	31	Reel disk (supply)
10	Guide arm assy	21	Timing belt	32	Supply reel sensor
11	A/C head	22	Take-up reel sensor (PHS1)		

Table 2-4-1 Main mechanical parts (Full loading)

2.4.2 Half loading

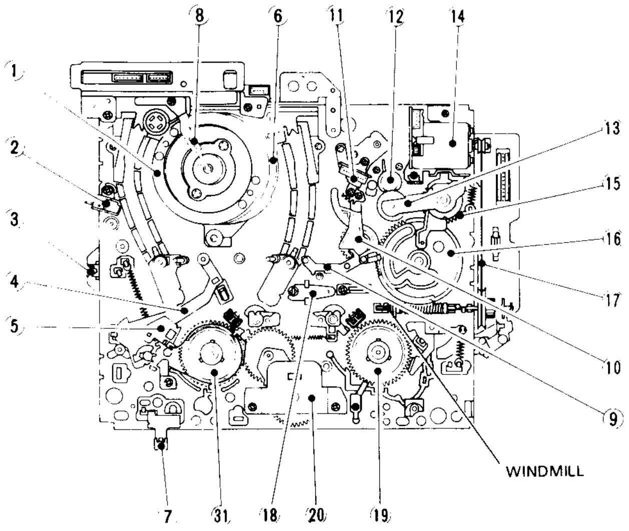


Fig. 2-4-4 Top view of main-deck

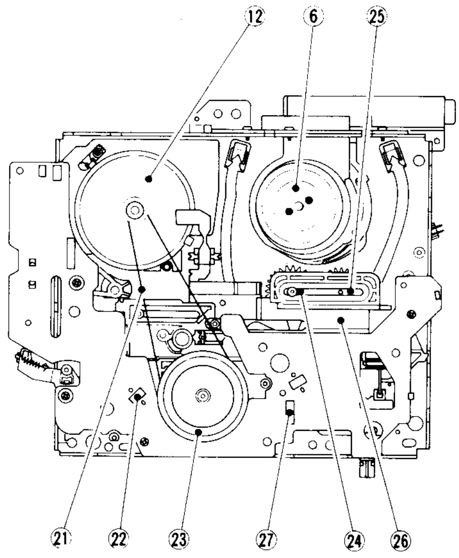


Fig. 2-4-5 Bottom view of main-deck

No.	Parts Name	No.	Parts Name	No.	Parts Name
1	Upper drum assy	10	Guide arm assy	19	Reel disk (take-up)
2	Full erase head	11	A/C head	20	Idler gear assy
3	End sensor	12	Capstan motor	21	Reel belt
4	Tension arm assy	13	Pinch roller arm assy	22	Take-up reel sensor
5	Tension band assy	14	Loading motor assy	23	Clutch assy
6	Lower drum motor assy	15	Pinch roller cam	24	Take-up loading arm assy
7	REC safety switch	16	Control cam	25	Supply loading arm assy
8	Brush assy	17	Loading belt	26	Plate assy
9	Half loading gear assy	18	LED holder	27	Slide switch
				31	Reel disk (Supply)

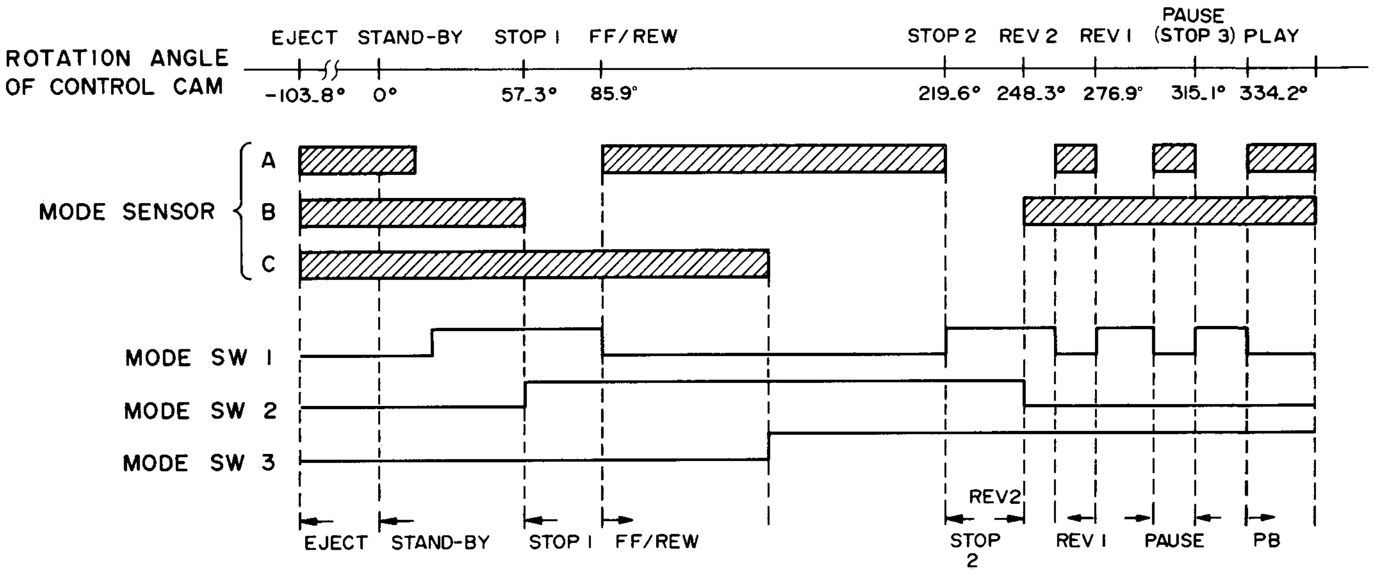
Table 2-4-2 Main mechanical parts (Half loading)

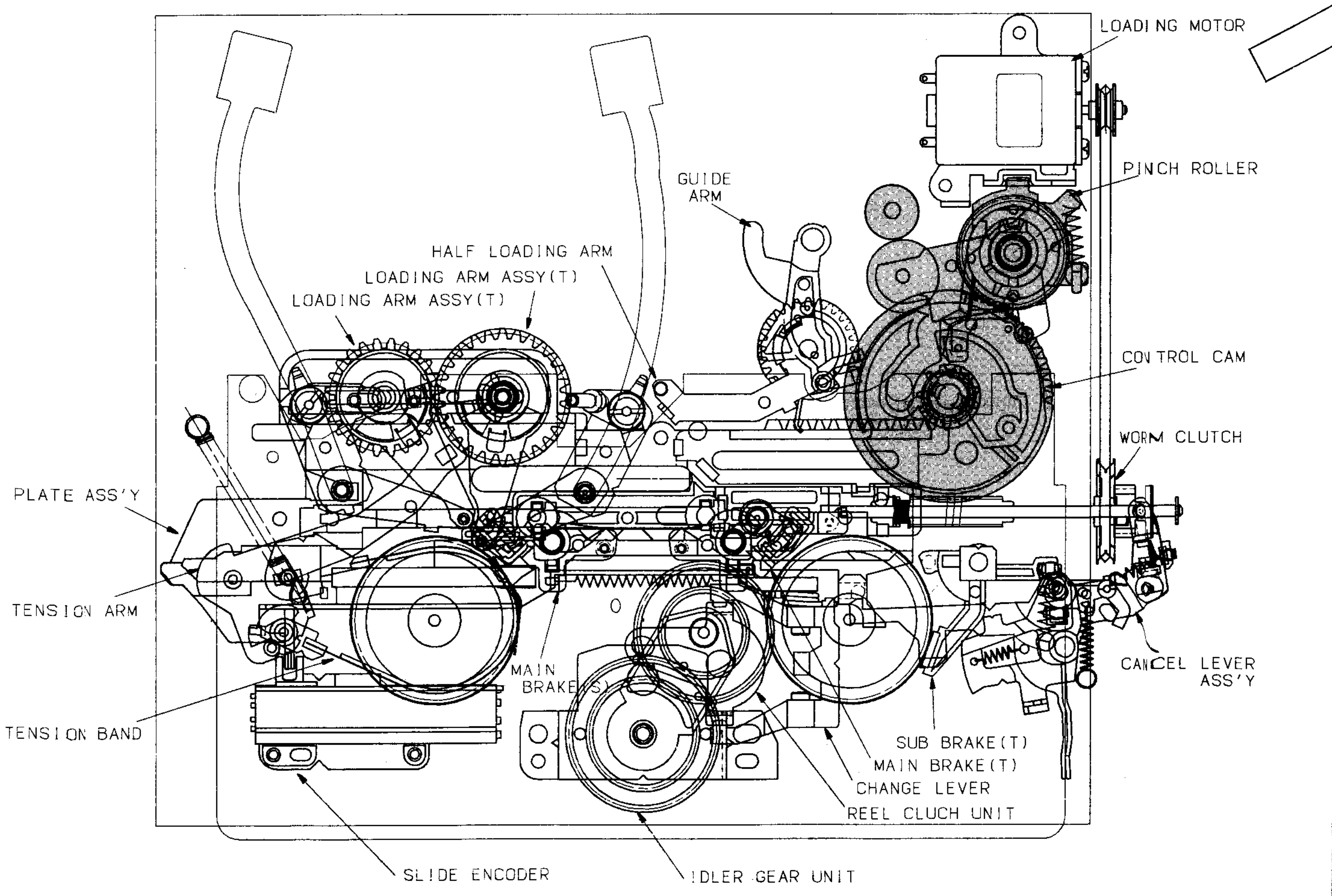
2.5 MECHANISM

Mechanism modes are set by rotation of the control cam, which is driven by the loading motor. The mode is detected by the mechacon CPU from the states of mode switches 1, 2 and 3.

The 8 mechanism modes are: Eject, Stop 1, FF/REW, Stop 2, Rev 2, Rev 1, Pause (Stop 3) and Play. Refer to the Mechanism Mode Table for the mechanism states in each mode.

The table describes the operations from the aspect of the control cam, pinch roller and capstan.

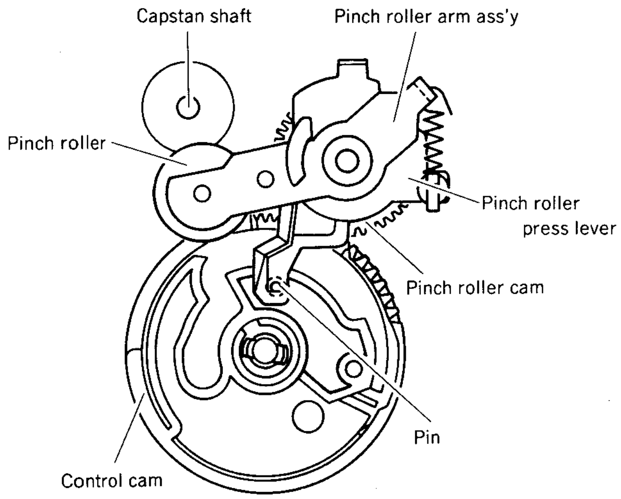



LOADING MOTOR
PINCH ROLLER
GUIDE ARM
HALF LOADING ARM
LOADING ARM ASSY(T)
LOADING ARM ASSY(T)
CONTROL CAM
WORM CLUTCH
PLATE ASS'Y
TENSION ARM
MAIN BRAKE(S)
CANCEL LEVER ASS'Y
TENSION BAND
SUB BRAKE(T)
MAIN BRAKE(T)
CHANGE LEVER
REEL CLUCH UNIT
SLIDE ENCODER
IDLER GEAR UNIT

2.6 MECHANISM MODE

2.6.1 ASSEMBLY mode

The control cam's angle of revolution is – 100°, and in this state the pinch roller press lever will be switched to UP.

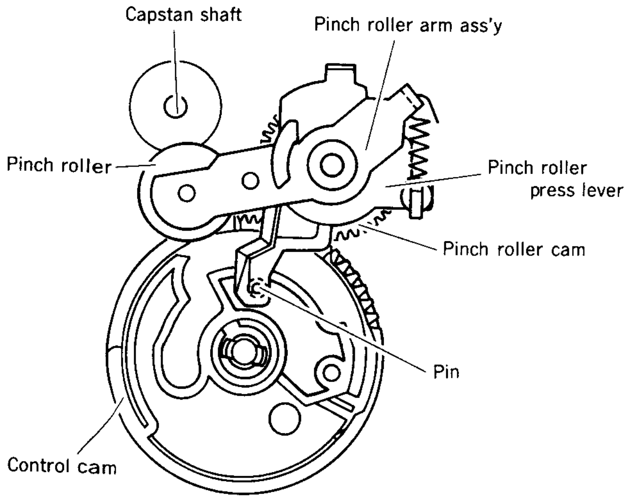

Capstan shaft
Pinch roller arm ass'y
Pinch roller
Pinch roller press lever
Pinch roller cam
Pin
Control cam

Control cam's angle of revolution: – 100°

Fig. 2-6-1 ASSEMBLY mode

2.6.2 Eject mode

The control cam's angle of revolution is – 103.8°, and the state of the pinch roller press lever will be almost the same as that in the ASSEMBLY mode.

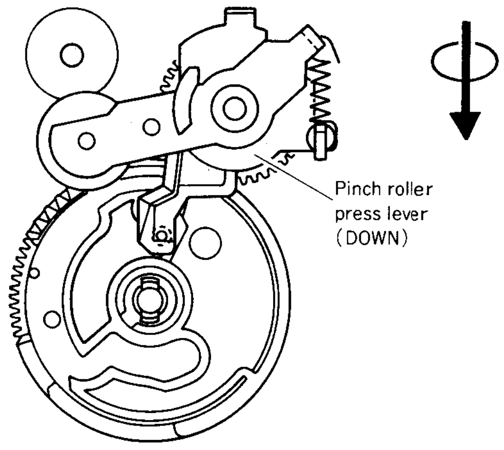

Capstan shaft
Pinch roller arm ass'y
Pinch roller
Pinch roller press lever
Pinch roller cam
Pin
Control cam

Control cam's angle of revolution: – 103.8°

Fig. 2-6-2 EJECT mode

2.6.3 STANDBY mode

The control cam's angle of revolution is 0°. The pinch roller press lever will start descending when a shift is made from EJECT mode to STANDBY mode, but will not be lowered completely. Naturally, the pin of the pinch roller press lever will not mesh with the control cam's grooves, so the pinch roller will assume the same position as that in the ASSEMBLY mode.

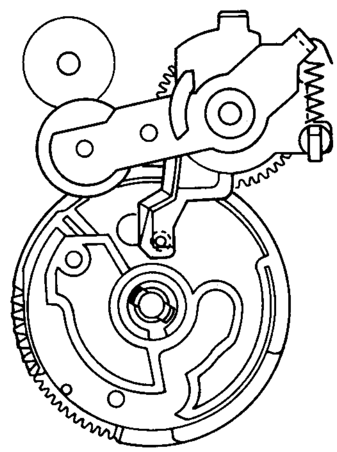

Pinch roller press lever (DOWN)

Control cam's angle of revolution: 0°

Fig. 2-6-3 STANDBY mode

2.6.4 STOP-1 mode

Namely, the half loading state will always be assumed after a cassette with mis-erasing prevention claw is inserted or the power is switched OFF with the cassette inserted. The control cam's angle of revolution is 57.3°, and the state of the pinch roller press lever will be about the same as that in the STANDBY mode.

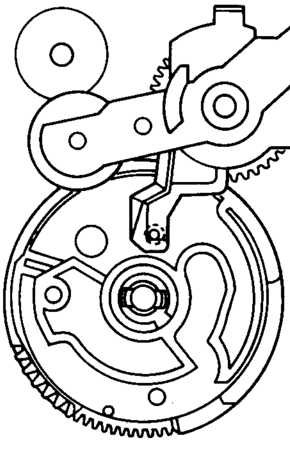


Control cam's angle of revolution: 57.3°

Fig. 2-6-4 STOP mode

2.6.5 FF/REW mode

The control cam's angle of revolution will be 85.9°. The pinch roller press lever will be lowered further than in the STOP-1 mode, but the pin will not be meshed with the control cam's grooves. (If the tape's remaining volume is not being computed, S-FF/S-REW will be performed first.)



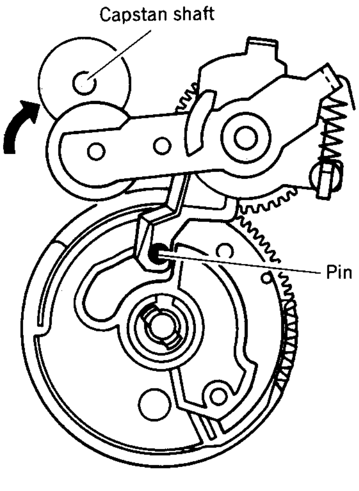
Control cam's angle of revolution: 85.9°

Fig. 2-6-5 FF/REW mode

2.6.6 STOP-2 mode

This model is designed for full loading as described in section 2.6.9 to enable speedy shift from stopped state to PLAY mode.

Therefore, to protect the tape and drum, the drum is stopped at an overtime of 5 min 25 sec to shift to this mode. The control cam's angle of revolution is 219.6°. The pinch roller press lever is descended fully, and the pinch roller press lever's pin is meshed with the control cam's grooves to shift the pinch roller toward the capstan shaft.



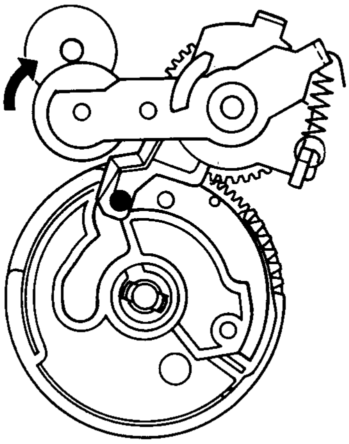
Control cam's angle of revolution: 219.6°

Fig. 2-6-6 STOP-2 mode

2.6.7 REVERSE-2 mode

The state of the mechanism will differ in that the tension band brake will be OFF with respect to the REVERSE-1 mode.

The tension is relaxed to prevent the tape from being damaged when reverse running is started. The control cam's angle of revolution is 248.3°, and the pinch roller will be shifted further closer to the capstan shaft compared with the position in STOP-2 mode and made to come into contact with the capstan shaft.

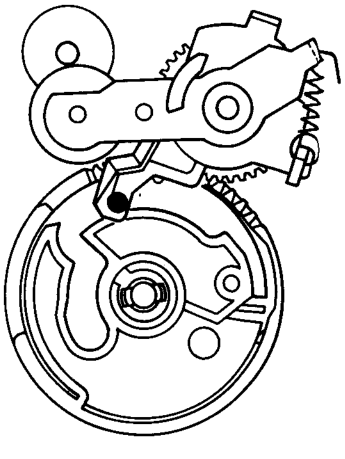


Control cam's angle of revolution: 248.3°

Fig. 2-6-7 REVERSE-2 mode

2.6.8 REVERSE-1 mode

Shifting to this mode may be through the REVERSE-2 mode. (When the supply side tape load is large.) The control cam's angle of revolution is 276.9°, and the state of the pinch roller will be the same as that in the REVERSE-2 mode.

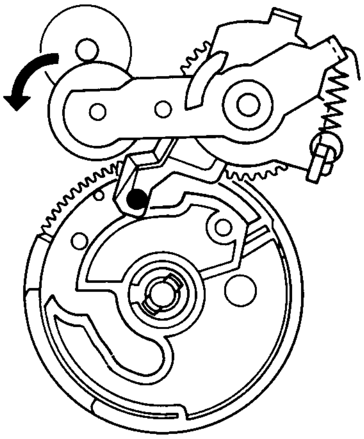


Control cam's angle of revolution: 276.9°

Fig. 2-6-8 REVERSE-1 mode

2.6.9 PAUSE (STOP-3) mode

This mode was newly introduced to enable speedy shift to FORWARD and/or REVERSE mode. With this mechanism, pressing the PAUSE/STILL pushbutton in play mode will stop the capstan motor as it is in the PLAY mode and enable shifting to the STILL mode. The STILL mode will be retained for about 5 min (5M25S), and subsequently a shift will be made to the PAUSE mode. Further about 5 min in PAUSE mode, shifting to STOP-2 mode will be made to prevent tape damage.
When the PAUSE/STILL pushbutton is pressed in REC mode, the mode will be shifted to the REVERSE-1 mode and, after back spacing, the mode will be shifted to PLAY mode (REC pause). Shifting from FF mode to REW mode will also be achieved via this mode.
With this mechanism, the pinch roller in full loading state will be slightly detached from the capstan shaft, and the tension band brake and takeup sub-brake will be switched to ON. In this state, releasing the PAUSE mode will instantaneously shift the mode to PLAY mode. The control cam's angle of revolution is 315.1°, and the pinch roller will be slightly detached from the capstan shaft due to the influence of the control cam's groove shape.

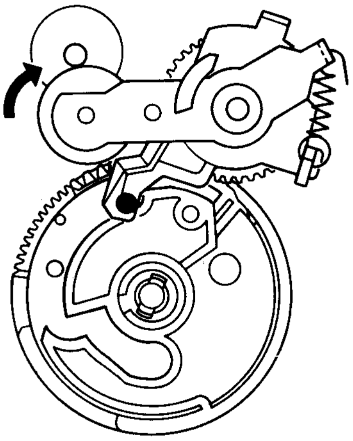


Control cam's angle of revolution: 315.1°

Fig. 2-6-9 PAUSE (STOP-3) mode

2.6.10 PLAY (PB, REC, REC PAUSE, S-FF, etc.) mode

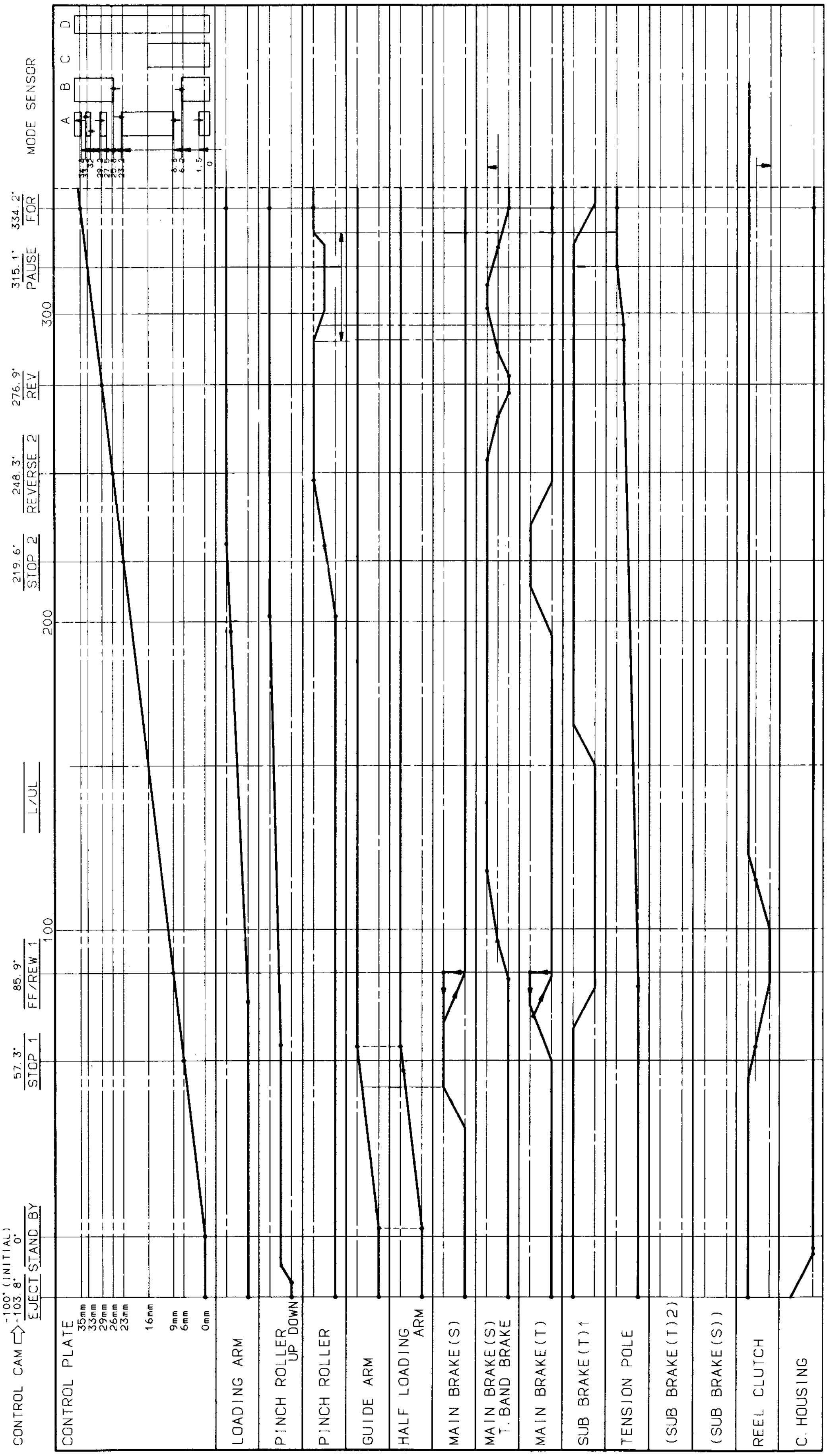
This mode will be the same as that of Model earlier models. The control cam's angle of revolution is 334.2°, and the pinch roller press lever will be fully depressed in the capstan's direciton by action of the control cam's grooves, causing the pinch roller to come into contact with the capstan shaft.



Control cam's angle of revolution: 334.2°

Fig. 2-6-10 PLAY mode

2.7 MECHANISM MODE TABLE


CONTROL CAM
-100° (INITIAL)
-103.8°
0°
EJECT
STAND BY
57.3°
STOP 1
85.9°
FF/REW 1
100
L/UL
200
219.6°
STOP 2
248.3°
REVERSE 2
276.9°
REV
300
315.1°
PAUSE
334.2°
FOR
MODE SENSOR
A
B
C
D
CONTROL PLATE
35mm
33mm
29mm
26mm
23mm
16mm
9mm
6mm
0mm
LOADING ARM
PINCH ROLLER UP DOWN
PINCH ROLLER
GUIDE ARM
HALF LOADING ARM
MAIN BRAKE(S)
MAIN BRAKE(S) T. BAND BRAKE
MAIN BRAKE(T)
SUB BRAKE(T)1
TENSION POLE
(SUB BRAKE(T)2)
(SUB BRAKE(S))
REEL CLUTCH
C. HOUSING

SECTION 3
CIRCUIT DESCRIPTION

3.1 NEW FUNCTIONS

3.1.1. Repeat

Two repeat playback functions are provided. One repeats the entire tape 5 times, and the other repeats the section between Index marks 5 times.

3.1.2 Auto blank search

1. Outline

Auto blank search refers to the function of sensing the tape's non-recorded part automatically, which is performed by judging the existence of the control pulses recorded on the tape. When the non-recorded part is sensed by the auto blank search function, the function will assume the STOP mode at the tape's final recorded part, or the state of half loading.

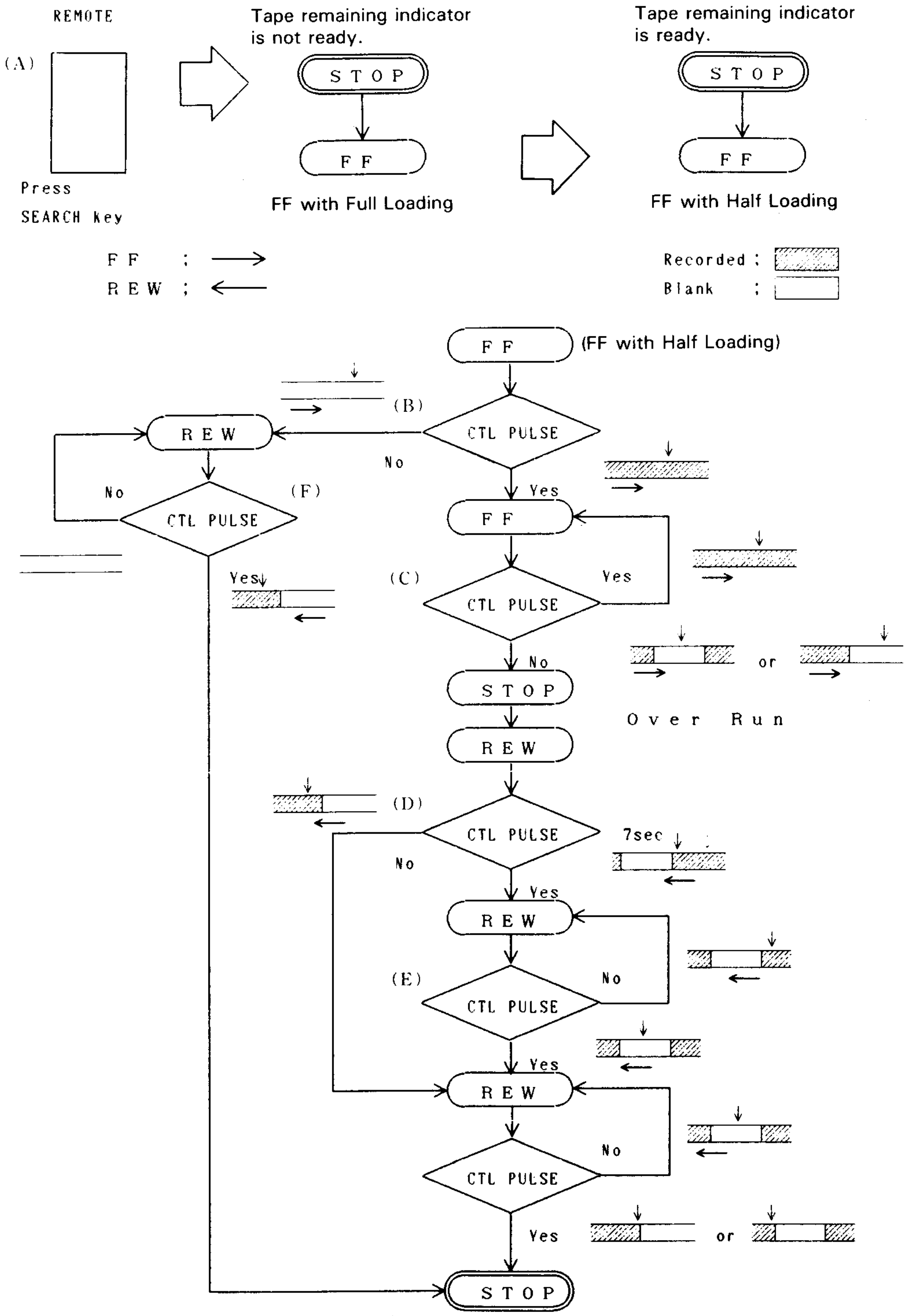

REMOTE
(A)
Press
SEARCH key
Tape remaining indicator is not ready.
STOP
FF
FF with Full Loading
Tape remaining indicator is ready.
STOP
FF
FF with Half Loading
FF ; →
REW ; ←
Recorded ;
Blank ;
FF
(FF with Half Loading)
(B)
CTL PULSE
No
Yes
REW
(F)
CTL PULSE
No
Yes
FF
(C)
CTL PULSE
Yes
No
or
STOP
Over Run
REW
(D)
CTL PULSE
No
7sec
Yes
REW
(E)
CTL PULSE
No
Yes
REW
CTL PULSE
No
Yes
or
STOP

Fig. 3-1-1 Auto blank search flow chart

2. Description of mechanism of operation

To actuate the auto blank search function, press the remote controller's search key (common button for SKIP/BLANK) in STOP mode (full loading or half loading state) with the cassette tape inserted in the model. The principle of operation of the auto blank search function shall be described in conformance with the flow chart, so please refer to the flow chart shown in Fig. 3-1-1.

Description of Flow Chart

(A) Actuating the auto blank search function when the tape's remaining volume has not been calculated will first switch the mode to search FF mode in full loading state to calculate the tape's remaining volume. After performing this calculation, the mode will be switched to FF mode in half loading state to detect the CTL PULSE. The auto blank search is achieved entirely in half loading state.

- This model incorporates the tape protection and tape remaining volume display functions, so if the tape's remaining volume has not been calculated, then actuating the tape running mode will give priority to calculating the tape's remaining volume, and the calculation will be made.
- In auto blank search mode, the state will be switched from tape remaining volume in-calculation state or full loading state to half loading state, and no CTL PULSE control will be achieved for about 4 sec till tape running is stabilized in FF operation. Therefore, during this period, no detection will be possible even if the tape has a non-recorded portion.

(B) CTL PULSE sensing is performed with the control head. In sections without any CTL PULSE or sections which are not recorded, the minimum spacing that can be discriminated will be about 7 sec in SP mode. This will be equivalent to the space existing as a non-recorded section erased by the full erase head when recording is finished. CTL PULSE sensing is performed after shifting to the FF mode in half loading state after tape running has been stabilized. In this case, if no CTL PULSE exists, the mode will be temporarily shifted to the STOP mode, then immediately switched to the REW mode. When CTL PULSEs exist, the FF mode will be maintained.

(C) CTL PULSEs are sensed once again, and the FF mode will be retained until the non-existence of CTL PULSE is confirmed. When there are no CTL PULSESs, the mode will be switched temporarily to the STOP mode, then immediately switched to the REW correction (REW mode).

(D) Immediately after shifting to REW correction, if CTL PULSEs do exist, the situation is judged as a state of recording having been performed over a recorded tape, and REW correction is continued to temporarily sense a section without any CTL PULSE, after which REW correction is continued to a place where a CTL PULSE exists.

Namely, the blank section will be about 7 sec or shorter in the event a new recording is performed over an eariler recording and stopped on the way, so the blank portion will be surpassed when a shift is made from FF mode to STOP mode, and stopped at the place where the preceding recorded part is remaining. Therefore, the blank section is first searched for by REW correction, then the newly recorded section's CTL PULSE is sensed. If there is no CTL PULSE immediately after switching to REW correction mode, REW correction will be continued until a CTL PULSE is sensed. However, the sensing of CTL PULSE in REV direction will be searched for while performing REW correction.

(E) Searching while performing correction in the REV direction will be consummated at the point where the existence of CTL PULSE has been confirmed, and the mode will be switched to the STOP mode in half loading state. In this case, the FDP display will indicate the tape's remaining volume.

(F) Searching will be continued until the existence of CTL PULSE has been confirmed, and consummated at the point where a CTL PULSE has been sensed, and the mode will be shifted to STOP mode in half loading state in the same manner as in section "E" above. However, in this case, the tape will be overlapped during the period from CTL PULSE sensing to shifting to the STOP mode, but in this case there will be no correction in the FWD direction.

Upon the completion of auto blank search, the FDP will display the tape's remaining volume in the STOP mode in half loading state.

- In the event the tape is fully recorded, FF will be continued to the tape's end where the mode will be switched to the STOP mode, and the remaining volume's display will be 0:00. Therefore, in this case, the auto rewind function cannot be executed.

3. Precautions in auto blank search operation

1) This model incorporates the tape remaining volume display function, so if the remaining volume's calculation has not been completed when the mode is switched to that for running the tape, the mechanical controlable CPU will execute the remaining volume calculation function. Accordingly since the CTL PULSE will not be controlled during this period, no blank portion will be detected even if it existed. To cope with this situation, the tape should first be run in the REW direction to perform and complete calculating the tape's remaining volume. The data obtained by calculating this remaining volume will be valid as long as the cassette is not extracted.

3.2 MECHACON/TIMER CIRCUIT

3.2.1 CPU pin functions

1. Mechacon CPU pin function (IC601): HR-D960 U/HR-D970 U

Pin No.	Symbol	I/O format	Label	IN/OUT	Contents
1	Vcc	—	Vcc	I	for the system control, DC 5V
2	VREF	—	Vref		
3	DA	Analog	AFC	I	TUNING CHECK DATA
4	PWM	PWM	AVG FM	I	AUTO TRACKING DATA (AVERAGE FM)
5	Port 6 4	N-ch OPEN DRAIN	R PAUSE	I	REMOTE PAUSE CONTROL (PAUSE ON: L)
6	3		PREROLL	O	PREROLL FUNCTION CONTROL
7	2		THERMS	I	THERMIC CORRECTION (CAPSTAN BREAK TIMING CONTROL)
8	1		MODE SENS B	I	MECHANISM MODE DETECT
9	0		MODE SENS A		
10	AN 7	Analog	MODE SENS C		
11	6		REC SAFETY	I	DETECTS ERASE PROTECT TAB (TAB ABSENT: H)
12	5		START SENS	I	START SENSOR, READER TAPE DETECT (ON: L)
13	4		DRUM CTL V	O	DRUM MOTOR DRIVE VOLTAGE SERVO
14	Port 4 3	N-ch OPEN DRAIN	CAP CTL V	O	CAPSTAN MOTOR DRIVE VOLTAGE SERVO
15	2		CASS SENS	I	CASSETTE SENSOR (CASS IN)
16	1		END SENS	I	END SENSOR, TRAILER TAPE DETECT (ON: L)
17	0		D FF	I	DRUM FF, REC TIMING CONTROL/DRUM ROTATION DETECT
18	Port 3 7	N-ch OPEN DRAIN	CTL PULSE	I	MODE (SP/EP/LP) DETECT/BLANK DETECT
19	6		X11	O	CAPSTAN SPEED CONTROL (X11 MODE: H)
20	5		V PULSE	O	V PULSE OUTPUT (SPECIAL PLAYBACK)
21	4		A/M/S	O	HEAD SELECT SIGNAL OUTPUT
22	3		NC	—	NC
23	2		NC		
24	1		SUP FG	I	REEL ROTATION DETECT/TAPE REMAIN DATA
25	0		TU FG		
26	$\overline{\text{INT-1}}$	—	CAP FG	I	MODE (SP/EP/LP) DETECT/BACK SPACE COUNT
27	CN Vss		CN Vss		(ALWAYS) GND
28	$\overline{\text{RESET}}$		RESET		RESET AT CONNECT VCR TO AC
29	X IN		X IN	I	MAIN SYSTEM CLOCK (4 MHz)
30	X OUT		X OUT	O	
31	ø		NC	—	NC
32			Vss	—	GND
33	Port 5 7	with Input Latch	D0 CTL	I	DOC MUTE (FM A DETECT)
34	6		REC START	O	REC START: L
35	5		HiFi REC ST	O	HiFi AUDIO REC START: L
36	4		AUX	O	INPUT SIGNAL SELECT, AUX: L
37	3	High Impedance	FE H CTL	O	FLYING ERASE HEAD CONTROL (ON/OFF)
38	2		P MUTE	O	PICTURE MUTE CONTROL: L
39	1		EE		EE MODE: L
40	0		A MUTE		AUDIO MUTE CONTROL: H
41	Port 1 7	N-ch OPEN DRAIN	FULL ERASE	O	FULL ERASE ON: H
42	6		V REC	O	REC MODE: H
43	5		P CTL		POWER CONTROL (P ON: H)
44	4		A. DUB	O	AUDIO DUBBING: L
45	3		A. REC		AUDIO REC: L
46	2		A. EE		AUDIO EE: L
47	1		FADE		EADER ON: L
48	0		SP		SP MODE: H
49	Port 0 7	N-ch OPEN DRAIN	MON SEL	O	AUDIO MONITOR SELECT (HiFi/NORM/MIX)
50	6		CH SEL		AUDIO CHANNEL SELECT (L/ST/R)
51	5		LP	O	LP MODE: L
52	4		NC	—	NC
53	3		PLL LOCK	I	TUNING DATA OUTPUT CHECK
54	2		PLL DATA	O	PLL TUNING DATA (18 bit)
55	1		S CLOCK	O	CLOCK (COMMON)
56	0		S DATA	O	SERVO IC CONTROL DATA
57	Port 2 7	C MOS	SYNC DET	I	SYNC DETECT (NO SIGNAL: H)
58	6		INDEX	I/O	INDEX DATA WRITE/READ CONTROL (VISS) (ON: L)
59	5		VIDEO	O	VIDEO MODE: L
60	4		PAUSE	O	CAPSTAN MOTOR SERVO
61	3		SERVO	O	〃
62	2		T CLK	I	CLOCK (TM bus)
63	1		T DATA	I/O	TM (TIMER/M-CTL CPU) bus DATA (16 bit)
64	0		CAP REV	O	REV MODE: L

Table 3-2-1 Mechacon CPU pin function

2. Timer CPU pin function (IC701): HR-D960U/HR-D970U.

Pin No.	Symbol	Label	I/O	Contents
1	D11/FS4	Se	O	SEGMENT DISPLAY DATA/KEY SCAN PULSE OUTPUT
2	D12/FS3	Sd		
3	D13/FS2	Sc	O	SEGMENT DISPLAY DATA OUTPUT
4	D14/FS1	Sb	O	SEGMENT DISPLAY DATA/KEY SCAN PULSE OUTPUT
5	D15/FS0	Sa		
6	R00/FD0	11G	O	COLUMN DISPLAY DATA
7	R01/FD1	10G		
8	R02/FD2	9G		
9	R03/FD3	8G		
10	R10/FD4	7G		
11	R11/FD5	6G		
12	R12/FD6	5G		
13	R13/FD7	4G		
14	R20/FD8	3G		
15	R21/FD9	2G		
16	R22/FD10	1G		
17	RF23/FD11	GRID END	I	LIGHTING DATA OUTPUT CHECK
18	RA0	$\overline{\text{TEST}}$	I	TEST POINT (CLOCK ADJUST)
19	RA1	POWER DOWN	I	POWER DOWN DETECT
20	R30/FD12	IND ON	O	LEVEL IND CONTROL (IND ON: L)
21	R31/FD13	DIM	O	DIMMER CONTROL (DIMINUTION: L)
22	R32/FD14	POWER	O	LED CTL (LED ON: H)
23	R33/FD15	AUTO TK		
24	R50	JSA	I	JOG PULSE INPUT (A)
25	R51	STILL		SHUTTLE SW (H: NO OPERATION)
26	R52	JS B		JOG PULSE INPUT (B)
27	R53	SAP REC	O	SAP REC LED CONTROL (LED ON: H)
28	R60/INT0	11G END	O	COLUMN DISPLAY DATA
29	R61/INT1	CNT PULSE	I	LINEAR TIME COUNTER DATA
30	R62/INT2	REMOTE	I	REMOTE DATA INPUT (A/B CODE)
31	R63/INT3	SYNC DET		SYNC L/H FROM ON SCREEN (NO SIGNAL H)
32	Vcc	Vcc	—	for SYSTEM CTL (MAIN POWER)
33	R40/SCK	OS-CLK	O	MEMORY DATA/ON SCREEN DATA
34	R41/SI	CS	O	
35	R42/SO	OS-DATA	I/O	
36	R43/PWM	PROG	O	PROGRAM MODE: H
37	R70/BUZZ	NC	—	NC
38	R71	TM CLK	O	TM (Timer CPU/M-CTL CPU) bus 16 bit SERIAL DATA
39	R72	TM DATA IN	I	
40	R73	TM DATA OUT	O	
41	R80	$\overline{\text{OS RESET}}$	O	ON SCREEN IC CONTROL
42	R81	OS CE		
43	R90	KS 0	I	KEY SCAN DATA INPUT
44	R91	KS 1		
45	R92	KS 2		
46	R93	KS 3		
47	RESET	RESET	I	RESET AT CONNECT VCR TO AC
48	OSC 2	OSC 2	I	MAIN SYSTEM CLOCK (4.19 MHz)
49	OSC 1	OSC 1	O	
50	GND	GND	—	GND
51	CL1	CL1	I	
52	CL2	NC	—	NC
53	TEST	+5	I	ALWAYS 5V LEVEL
54	D0/FS15	Sp		SEGMENT DISPLAY DATA OUTPUT
55	D1/FS14	So		
56	D2/FS13	Sn		
57	D3/FS12	Sm	O	SEGMENT DISPLAY DATA/KEY SCAN PULSE OUTPUT
58	D4/FS11	Sl	O	SEGMENT DIPSLAY DATA OUTPUT
59	D5/FS10	Sk	O	SEGMENT DISPLAY DATA/KEY SCAN PULSE OUTPUT
60	D6/FS9	Sj	O	SEGMENT DISPLAY DATA OUTPUT
61	D7/FS8	Si		
62	D8/FS7	Sh	O	SEGMENT DISPLAY DATA/KEY SCAN PULSE OUTPUT
63	D9/FS6	Sg		
64	D10/FS5	Sf		

Table 3-2-2 Timer CPU pin function

3.2.2 CPU system

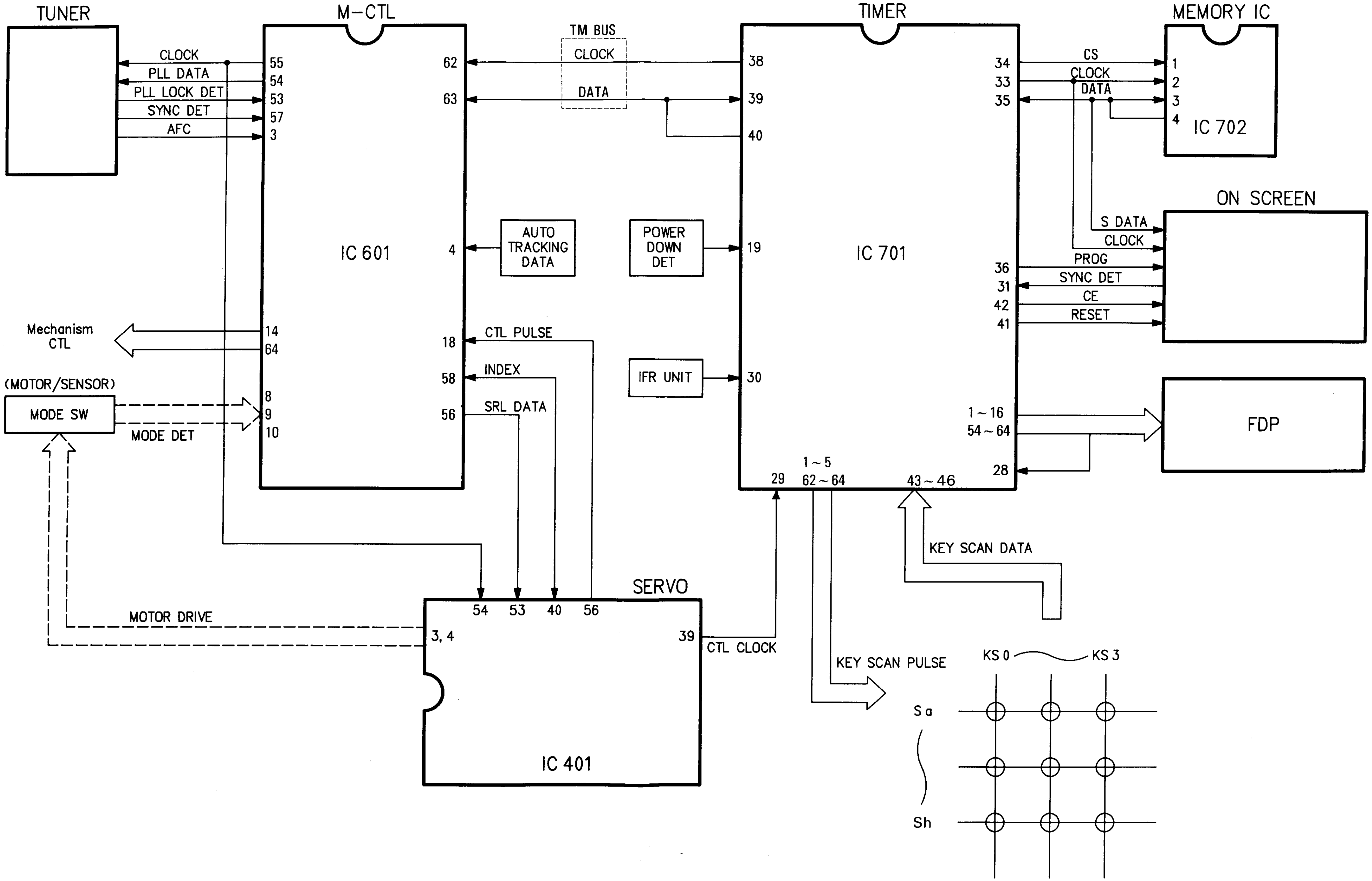

TUNER
CLOCK
PLL DATA
PLL LOCK DET
SYNC DET
AFC
M–CTL
55
54
53
57
3
62
63
IC 601
4
14
64
18
58
56
8
9
10
Mechanism CTL
(MOTOR/SENSOR)
MODE SW
MODE DET
CTL PULSE
INDEX
SRL DATA
TM BUS
CLOCK
DATA
AUTO TRACKING DATA
POWER DOWN DET
IFR UNIT
TIMER
38
39
40
19
30
IC 701
29
1 ~ 5
62 ~ 64
43 ~ 46
28
34
33
35
36
31
42
41
1 ~ 16
54 ~ 64
MEMORY IC
CS
CLOCK
DATA
1
2
3
4
IC 702
ON SCREEN
S DATA
CLOCK
PROG
SYNC DET
CE
RESET
FDP
KEY SCAN DATA
SERVO
54
53
40
56
3, 4
39
IC 401
MOTOR DRIVE
CTL CLOCK
KEY SCAN PULSE
KS 0
KS 3
S a
Sh

Fig. 3-2-1 CPU system block diagram

3.2.3 Mechacon and timer operations

1. Switches and sensors

The following are explanations about switches and sensors used for the mechacon'to detect conditions of the machine:

1) REC SAFETY switch

   This switch built into the cassette housing detects presence or absence of a cassette's tab for avoiding erroneous erasure of recorded contents, and it turns on with detection of the presence of a safety tab. When this switch is turned off, the deck does not enter REC and REC Pause modes.

2) CASSETTE sensor

   This detects the condition of the cassette housing. (See section 3.2.3-2)

3) START sensor

   This detects the leader tape of a video cassette tape, and it turns on as the leader tape is detected.

   If it detects the leader tape in Stop mode, it forwards the tape in the FF direction until the leader tape is not detected.

4) END sensor

   This detects the trailer tape of a video cassette tape, and it turns on when the trailer tape is detected.

   When it detects the tape in all modes except the Stop mode and TIMER REC/one-touch TIMER REC operation, the deck automatically enters the REW mode.

   In case of TIMER REC/one-touch TIMER REC, the power is turned off after the cassette is unloaded and ejected.

5) Supplementary explanation about the START and END sensors

   Besides the above-mentioned functions, both sensors are used to detect the condition of the cassette housing. (Refer to section 3.2.3-4)

   When both sensors are turned on in the state of cassette load end, the mechacon considers the tape broken and the cassette is ejected.

6) REEL sensors

   These detect rotation of reel disks. If the take-up reel is stopped for longer than 3 seconds other than in stop, eject, pause or still mode, the deck goes into stop mode.

7) MODE switch-1, -2, -3

   These are for detection of the mechanism's mode.

8) DRUM FLIP-FLOP signal

   This signal is used to take REC timing of video signals and drum rotation.

9) CAPSTAN FG signal

   This signal is used to detect SP/EP mode, tape remain and back-space counting.

10) CONTROL pulse

    This is used for detection of SP/EP mode.

2. Cassette housing

In this model, the condition of the cassette housing is detected by a photo-sensor (cassette sensor).

Table 3-2-3 below shows the relationship between conditions and the cassette sensor's outputs.

Condition of cassette housing	Cassette sensor's output
Loading	H
Ejection	H
Loading End	L
Eject End	L
Cassette Input Detection	_/‾

Table 3-2-3 Cassette sensor outputs

As cassette sensor outputs at Loading End and Eject End are L (low) potentials (see Table 3-2-3), the mechacon can not discriminate the condition of the cassette housing soon after the AC power is turned on. Therefore, it refers to outputs of the start sensor and end sensor at the same time. Accordingly, Eject End is considered to be in the condition that both outputs of the start sensor and the end sensor are LOW, while Loading End is regarded as in the condition that one or both of start sensor output and end sensor output is HIGH.

According to the above description about the mechacon's operation for the cassette housing control system, such servicing hints as the following can be given.

3. How to insert and remove the cassette

If loading is not completed within about 3 seconds of the start of cassette insertion, the power goes off. Also, if the cassette ejection is not complete within 3 seconds of starting, the cassette is loaded and the power goes off.

4. Here are the operations and states for each possible combination of start sensor and end sensor states after the cassette is inserted.

ST SENS	END SENS	Operation, State
OFF	OFF	Cassette loading complete (Stop mode)
OFF	ON	Trailer tape detection
ON	OFF	Leader tape detection *1
OFF	OFF	Ejection

Table 3-2-4

*1 The tape is fast forwarded to the position at which the start sensor goes off.

5. Mechanical controller operations

1) POWER ON

Power On is the state in which the power lamp is lit. This state is reached with either of the following operations.

a. Press the POWER button.
b. Insert a cassette.

When Operation b is used, after the power is brought on, the cassette is loaded.

- First operation after turning on the power

(a) Normal operations
If there is a cassette in the deck, the cassette mark lights and the signal system is in EE mode. The RF switch remains on the TV side.

- The presence or absence of a cassette in the deck is indicated by the fluorescent display tube, which lights up the cassette mark.

(b) Operations in special states
If the mechanism is not in stop mode, it goes into stop mode.

2) POWER OFF

Power Off is the state in which the power lamp is off. This state is reached by pressing the POWER button.

- Operations after power Off

(a) Normal operations
The RF switch goes to the TV side and the signal system output is cut. No operations other than Power On and Eject are accepted. The presence or absence of a cassette in the deck is indicated by the fluorescent display tube, which lights up as a cassette mark.

(b) Operations in special states
If the mechanism is not in stop mode, it goes into stop mode, then the power goes off.

3) CASSETTE HOUSING

(a) When the cassette sensor signal is _↑‾ , the cassette is loaded.
(b) When a cassette is loaded, if the operation is not completed within 3 seconds of starting, the deck goes into eject mode.
(c) In eject mode, if the operation is not completed within 4 seconds of starting, the power goes off.
(d) Cassettes can be inserted and ejected with the power off.
  - If a cassette is inserted with the power off, the power comes on, then the cassette is loaded.
  - If the EJECT button is pressed with the power off, the power comes on, the cassette is ejected, then the power goes off again.

4) AUTOMATIC OPERATIONS

(a) Cases of automatic stop mode
1. When a counter Go To or counter memory operation is carried out.
2. In REW or SEARCH REV mode, when the tape reaches it start.
   When the tape leader is detected, the tape is wound forward till the leader is hidden, then the deck goes into stop mode.
3. When the deck is left in PAUSE/STILL mode for 5 minutes 25 seconds.
4. In play, recording, search, or FF/REW mode if the take up reel disk rotation stops for about 3 seconds.
5. In play, recording, still, or search mode if the drum motor rotation stops for about 3 seconds.

(b) Cases of automatic ejection
1. In timer recording mode or one-touch timer recording mode, when the end of the tape is reached, the tape is ejected, then the power goes off.
2. During cassette loading, if the loading is not completed within 3 seconds of its start.
3. If both the start sensor and the end sensor are on.
4. If the REC SAFETY switch goes off during recording mode.
5. When the cassette has no write-protection tab, if the TIMER button is pressed to switch on the timer, the cassette is ejected, then the power goes off.

(c) Cases of automatic rewinding
1. At the end of the tape in play, recording, SEARCH FWD, or FF mode.
2. When a counter Go To operation is carried out.

(d) Cases of automatic pause
20 seconds before the start of timer recording.

(e) Cases of automatic play
1. For the auto play operation.
2. When a tape with the write-protection tab removed is loaded.

(f) Cases of automatic recording
2 seconds before the start of timer recording.

(g) Cases of automatic power on/off

1. The power comes on 20 seconds before the start of timer recording and goes off upon completion.
2. When the power is restored after a power failure, if the mechanism is not in stop mode, after unloading the power goes off.
   If power failure occurred during timer recording, after unloading, the deck goes into recording mode.
3. After the start of loading or unloading, if the operation is not completed within about 8 seconds, the power goes off.
4. After the start of ejection, if the operation is not completed within about 3 seconds, the power goes off.
5. Upon completion of one-touch timer recording, after unloading the power goes off.
6. At the end of the tape in timer recording or one-touch timer recording mode, the cassette is ejected, then the power goes off.
7. When the cassette has no write-protection tab, if the Timer button is pressed to switch on the timer, the cassette is ejected, then the power goes off.

5) TIMER MODE

(a) 20 seconds before the time programmed for the timer, the power comes on and the mechanism goes into Pause mode. Recording starts 2 seconds before the time programmed for the timer. At the end time for recording, the mechanism goes into timer standby mode, then the power goes off.

(b) When the cassette has no write-protection tab, if the Timer button is pressed to switch on the timer, the cassette is ejected, then the power goes off.

(c) During timer recording, if the TIMER button is pressed, timer mode is ended, the deck goes into normal recording mode, and the program is erased.

(d) If the end of the tape is reached in timer recording mode, the cassette is ejected, then the power goes off and the program is erased.

6) ONE-TOUCH TIMER

The one-touch timer uses the ordinary REC button. The operations are:

REC → 0 : 30 → 1 : 00 → 1 : 30 → 2 : 00 → 2 : 30 → 3 : 00 →3 : 30 →4 : 00 → REC → .....

When the recording time has been selected, when the timer recording ends, after unloading, the power goes off.

During one-touch timer recording, the only controls that work are the ONE TOUCH TIMER and TV/VIDEO buttons. One-touch timer recording is impossible if the cassette does not have its write-protect tab.

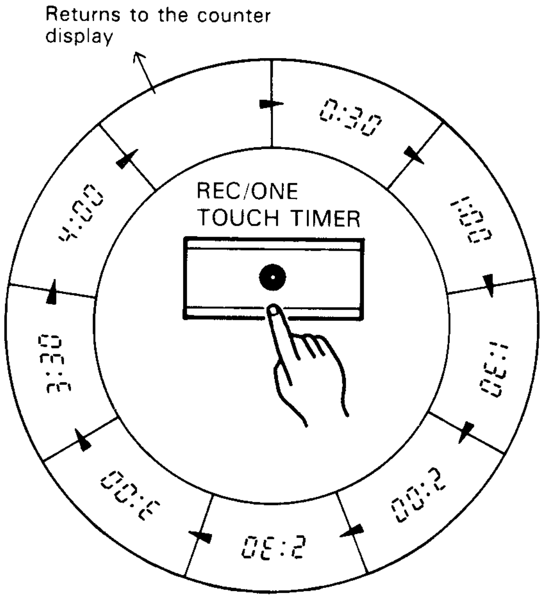


Fig. 3-2-2 One touch timer

1. TM bus

1) Outline

In previous models, the TM bus (for data transfer between the mechacon and timer CPUs) used a 4-bit bus line (parallel transfer) and strobe signal. The serial data transfer system of this model uses clock and data lines. The TM bus is controlled by the timer CPU, which is always accessed while power is supplied (data transfer between mechacon and timer CPUs) and repeatedly checks the deck status.

2) TM bus data composition and timing

Data are comprised of 16 bits, of which 4 bits are address and 12 bits are data (see Fig. 3-2-3, 3-2-4).

Clock output is from the timer CPU. Data transfer timing differs between timer to mechacon, and from mechacon to timer, as indicated in Figs. 3-2-3, 3-2-4.

- Mechacon to timer
  Data transfer from the mechacon CPU is synchronized with the clock signal produced by the timer CPU itself.
- Timer to mechacon
  As indicated in Fig. 3-2-3, the mechacon accepts input data when the timer data line drops from High to Low (point A). Transfer is complete when the clock is High and the data line rises from Low to High (point B). However, Low level is held until completion of mechacon processing (point C).
  *Data latch is at the clock rise and data shift is at the clock fall.

3) TM bus data

a) Data transferred from the mechacon to timer CPU

- Vertical jitter compensation data
- Slow tracking data
  In this model, the vertical jitter and slow tracking adjustment data are stored in the channel memory IC. These adjustments are operated by the front panel UP/DOWN buttons. At power ON, the timer CPU reads the data from the memory IC. These are transferred to the mechacon and stored in the RAM, after which the mode changes to transfer from mechacon to timer.
  Adjustment is performed using these stored data. After adjustment, the data are returned to the channel memory IC and refreshed. (V jitter adjustment data)
- Confirming deck status
  (The timer CPU cannot determine the deck status.)
  Examples: Cassette present/absent
  REC safety switch ON/OFF
  Tuner mode
  Start/end sensors
  Mechanism mode
- VHS Index Search System
  Mode check
  The mechacon accesses the servo circuit directly for index write-in and detect. Information feedback is required for checking the mode.

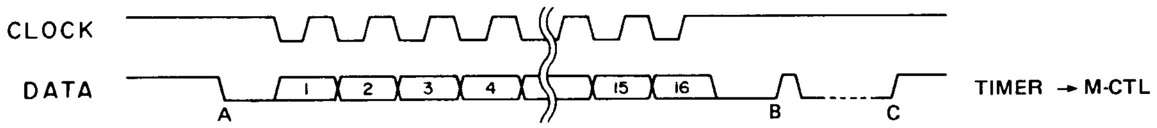


Fig. 3-2-3 Timer to mechacon bus data timing

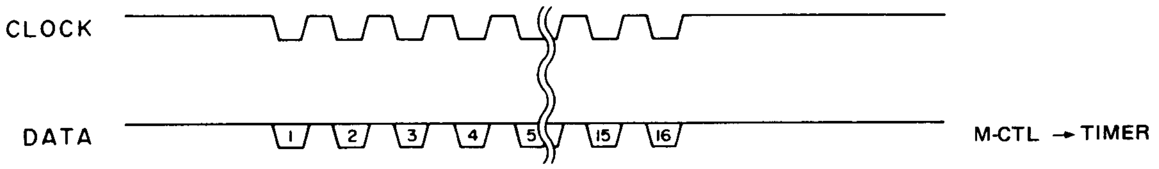


Fig. 3-2-4 Mechacon to time bus data timing

b) Data transfer from timer to mechacon CPU

- Key scan data

  This model does not use operation key inputs to the mechacon CPU. Instead, these are sent to the timer CPU as key scan data. Similarly remote controller operations are also entered in the timer CPU. Operating data for recording, playback, etc. are first sent to the timer CPU, then transferred via the TM bus to the mechacon CPU. The mechacon then controls the mechanism according to these data.

  Examples: Deck operation
  Switch states
  Channel setting
  Timer program setting
- Remote control code
- Timer recording data
- Channel data

  The channel memory IC readout data (V jitter, slow tracking data and channel data) are sent to the mechacon CPU. During station selection, this CPU determines if a particular channel is set for skip or store.

2. Motor driver IC

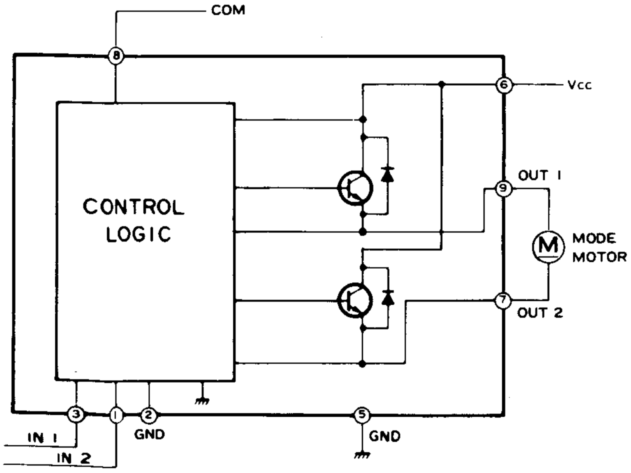


Fig. 3-2-5 IC1 Block

INPUT		OUTPUT		MODE	MOTOR
IN1	IN2	O1	O2		
3	1	7	9		
H	L	L	H	FWD	MODE
L	H	H	L	REV	
H	H	L	L	BRAKE	
L	L	O	O	STOP	

Note: O; Open

Table 3-2-5 IC1 Truth table

3.3 VIDEO CIRCUIT

3.3.1 Luminance (Y) signal recording system

1. Keyed AGC (Automatic Gain Control)

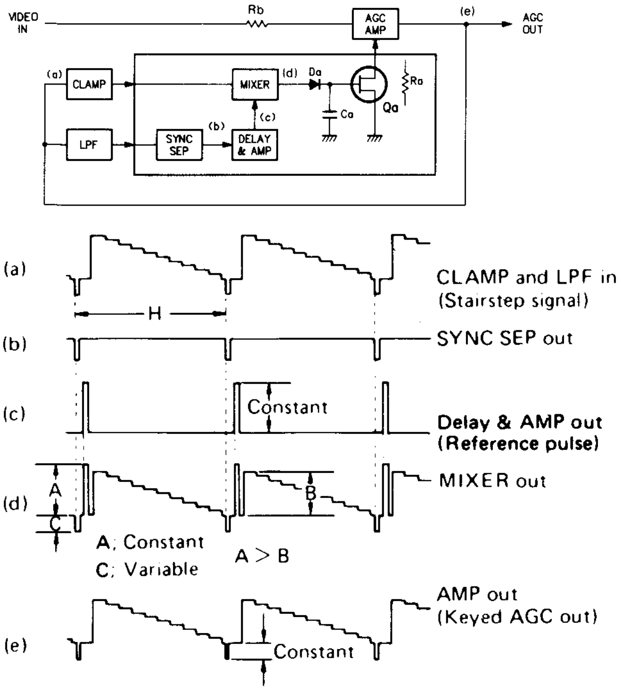


Fig. 3-3-1 Keyed AGC principle

The AGC out signal appears at the clamp and LPF as waveform (a). Sync tip is clamped at a fixed DC potential and the signal is supplied to the mixer. Waveform (b) is obtained following sync separation through a lowpass filter. This is delayed to match the phase of the back porch of waveform (a) horizontal sync component, amplified to a fixed level and mixed to become waveform (c).

At the mixer, the H sync back porch is mixed at a fixed level which is slightly higher than the 100% video level, as indicated by waveform (d). Level of this added reference pulse is fixed and the signal is rectified by Da and Ca. The rectified voltage varies the impedance (Ra) between Qa drain and source. Level of the input video signal supplied to the amplifier becomes controlled by the ratio of Ra to Rb.

For example, when the input signal level is high, the sum of the sync and reference levels increases and the rectified output becomes larger. When applied to Qa gate, this larger voltage decreases the impedance Ra between Qa source and drain. As a result, the input level to the amplifier becomes attenuated by the ratio of Ra to Rb.

In the above manner, because of the fixed added pulse level, the rectified output becomes determined by the sync level By this process, the keyed AGC circuit functions to maintain a fixed sync level.

An advantage of the keyed AGC circuit is that its output level does not vary with change in the average picture level (APL) of the input video signal. This permits use of the above mentioned non-linear pre-emphasis system.

2. LPF (Low-pass filter)

LPF eliminates the color signal from the composite color video signal and extracts the luminance signal. Therefore, the cutoff frequency is about 3 MHz and it is designed so that an attenuation of 25 dB or more can be obtained at 3.58 MHz.

This LPF incorporates a delay compensation circuit in order that the luminance signal and color signal match each other on the tape.

3. Clamp

When the luminance signal is frequency-modulated, it is determined that a certain frequency (3.4 MHz) is obtained in the sync signal portion. For this reason, a circuit which suppresses the sync signal portion to a predetermined DC voltage value regardless of the brightness of the image is required. This circuit is called a clamp circuit.

4. Non-linear emphasis

The non-linear emphasis circuit further enhances the effect of the pre-emphasis circuit. Normally, this circuit emphasizes the higher frequencies in order to improve the S/N ratio during playback; when there is a larger energy component only at higher frequencies, the degree of emphasis of higher frequencies is decreased, preventing trouble caused by over-emphasis including the missing of components by the subsequent clip circuit, overmodulation by the frequency modulator, or resultant inversion in the worst case.

5. Pre-emphasis

The pre-emphasis circuit is intended to improve the S/N ratio at higher frequencies. Generally speaking, if the frequency is increased, the demodulation noise increases linearly. However, if the pre-emphasis circuit is used, gain can be decreased during playback by the amount it is pre-emphasized by the pre-emphasis circuit during recording with the result that the S/N ratio can be improved.

6. W/D (White and Dark) clip

The luminance signal passed through the pre-emphasis circuit develops sharp overshoot at the leading edge of the white signal portion or the trailing edge of the black signal portion, and if the signal is frequency-modulated as it is, then recorded on the tape and played back, it results in overmodulation, causing the inversion phenomenon. Even if it does not lead to inversion, the portion corresponding to the sharp overshoot tip has a lower S/N ratio.

Therefore, overshoot exceeding a certain predetermined value should be clipped.

7. Frequency modulator

The frequency modulator is an oscillator whose oscillation frequency varies in accordance with the input signal. The oscillation frequency is set to 3.4 ± 0.1 MHz at the tip of the sync signal and 4.4 ± 0.1 MHz at the white level. The frequency deviation is set to 1.0 ± 0.1 MHz.

8. FM carrier interleave

During the REC mode, fine square wave voltage which oscillates at every field is overlapped over the frequency modulator input. This is called FM carrier interleaving, and is performed so that the carrier frequency is deviated by 1/2 Fh between adjacent tracks on the tape pattern. This is intended to reduce the visual influence of crosstalk from the adjacent tracks when guard band-less recording is performed.

9. HPF (high-pass filter)

The HPF is provided to eliminate the sidebands of the FM luminance signal which is present at lower frequencies (629 ± 500 kHz) where the down-converted color signal is overlapped.

10. REC amp

The REC amp makes the recording current at 3.4 MHz or more the saturated recording current, boosts the 2 MHz recording current by 3 ± 1 dB and the 1 MHz recording current by 6 ± 1 dB while the 1 MHz or less current has a flat characteristic so, when the FM signal is recorded on the tape, the optimum recording level can be obtained with respect to each frequency.

3.3.2 Luminance (Y) signal playback system

1. Pre-amp and channel switcher

The playback signal obtained from the video heads via the rotary transformer is amplified by about 60 dB by the pre-amp before being fed to the channel switcher. The channel switcher alternately switches the two-channel pre-amp outputs using the drum flip-flop signal so that the continuous playback signal can be output.

2. HPF

The HPF eliminates the down-converted color signal (629 ± 500 Hz) from the playback signal and extracts only the FM luminance signal.

3. Playback EQ amp

The higher frequency component of the playback FM signal has attenuated characteristics. These are more the higher the frequency. For this reason, the higher frequency component is corrected using the playback equalizer amplifier in order to make the frequency response flat.

4. FM AGC and DOC

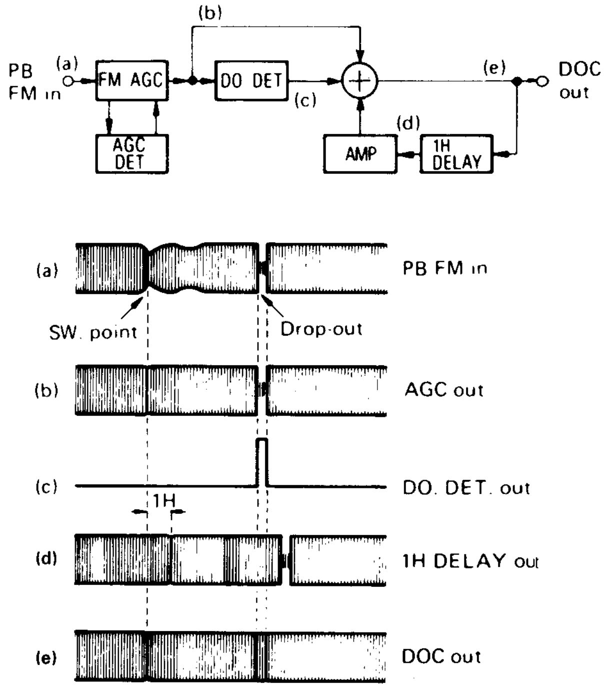


Fig. 3-3-2 Dropout compensator

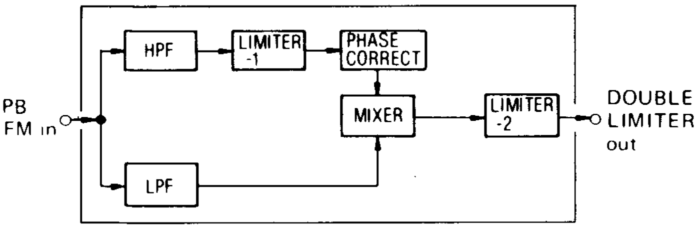
Defects in the tape, such as magnetic particle losses, can cause loss or reduction of the FM signal, which may impair picture quality. When this occurs, the dropout compensator functions to insert the FM signal from the previous horizontal line, thereby preventing visible effects in the picture.

The FM AGC circuit first corrects for level fluctuations in the playback FM signal, which arise from variations in head to tape contact at the intake and output of the rotating drum. This results in a fixed level as indicated by waveform (b) in Fig. 3-3-2.

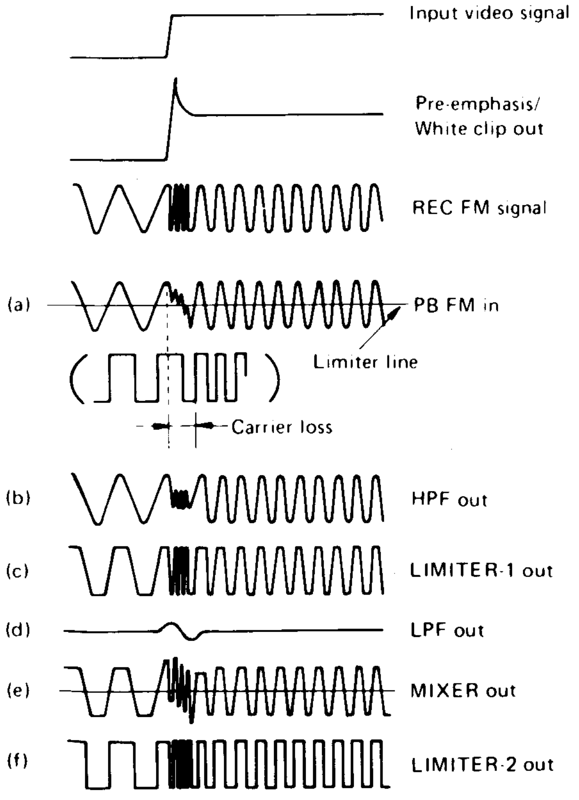
Part of this output goes directly to the switching circuit, while another part is applied to the dropout detector. In the dropout detector circuit, a highpass filter cuts the low sideband of the FM signal and an integrator detects the dropout component. A precise squarewave is formed and supplied as waveform (c) to the switching circuit.

A 1H delay circuit and amplifier return part of this signal to the switching circuit as waveform (d). When (c) is low, output (b) is produced from the switcher. In event of dropout, (c) becomes high and output (d) is obtained. In this manner, the signal from the previous horizontal line becomes inserted in place of the dropout component. The loop circuit design of the DOC increases its effectiveness.

5. Double limiter circuit



PB FM in
HPF
LIMITER -1
PHASE CORRECT
MIXER
LIMITER -2
LPF
DOUBLE LIMITER out



Input video signal
Pre-emphasis/ White clip out
REC FM signal
(a)
PB FM in
Limiter line
Carrier loss
(b)
HPF out
(c)
LIMITER-1 out
(d)
LPF out
(e)
MIXER out
(f)
LIMITER-2 out

Fig. 3-3-3 Double limiter principle

Overshoot can result when pre-emphasis is applied to a signal which varies from black to white level. The playback FM signal is indicated by waveform (a) in Fig. 3-3-3.

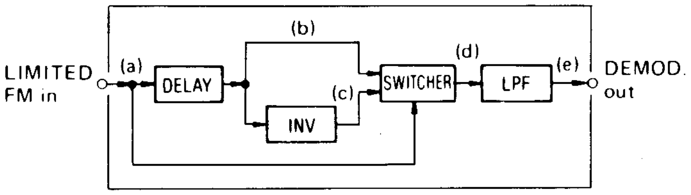
If limiting is applied at the limiter line at the center of the waveform excursion, it cannot correct the carrier loss component and black/white reversal and impaired S/N can occur. For this reason, the signal is applied to highpass and lowpass filters which separate the carrier and lower sideband components, as indicated by (b) and (d).

The signal through the highpass filter goes to Limiter-1 which applies approximately 10 dB limiter gain, then to the mixer. At the mixer, the signals from the HPF and LPF are mixed and sent to Limiter-2. This is shown by waveform (e).

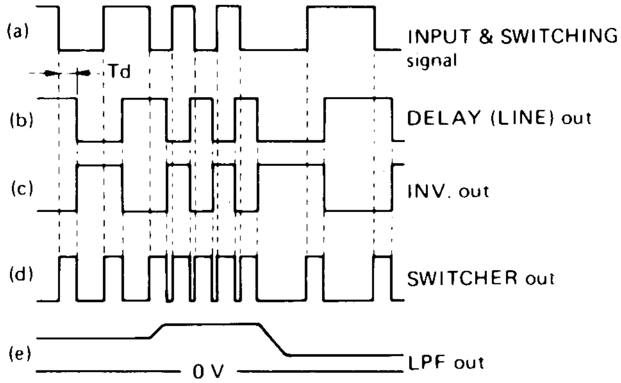
Phases of the signals are aligned by the phase correct circuit. As can be noted from waveform (e) limiting can be applied to the lower sideband component without losing signal information.

With the double limiter, the noise component is not amplified, while the carrier and lower sideband ratio is corrected. This serves to eliminate carrier loss and prevent black/white reversal. As a result, adequate pre-emphasis can be applied for improved S/N at high frequency.

6. Demodulator circuit



LIMITED FM in
(a)
DELAY
(b)
INV
(c)
(d)
SWITCHER
(e)
LPF
DEMOD. out



(a)
INPUT & SWITCHING signal
Td
(b)
DELAY (LINE) out
(c)
INV. out
(d)
SWITCHER out
(e)
0 V
LPF out

Fig. 3-3-4 Demodulator principle

Part of the signal from the limiter goes directly to the switching circuit as the switching pulse. In the other route the signal goes through a delay circuit, then to the switcher as waveform (b) in Fig. 3-3-4.

The delayed output through the inverter enters the switcher as waveform (c). Since the delay amount (Td) is 1/4th the FM carrier period of 3.9 MHz, it becomes approximately 0.064 μsec.

A low switching pulse (a) produces the switching circuit output shown by (b), while a high pulse results in (c). Consequently, the switching circuit output becomes as shown by waveform (d). This is integrated through a lowpass filter to yield the AM luminance signal indicated by (e).

7. LPF

LPF eliminates the FM carrier frequency and the leakage of its second harmonic.

8. De-emphasis

The de-emphasis circuit has the opposite characteristics to those of the pre-emphasis circuit and restores the original signal.

9. Non-linear de-emphasis

The non-linear de-emphasis circuit provides characteristics completely opposite to those of the non-linear emphasis circuit, and restores the original emphasized higher frequency component.

10. Line noise canceller

Fig. 3-3-5 shows the block diagram of the line noise canceller and Fig. 3-3-6shows its timing chart.

Since playback luminance signal (B) has strong line correlation with its 1H delayed signal (C), their differential output (D) provides the noise component which has no line correlation.

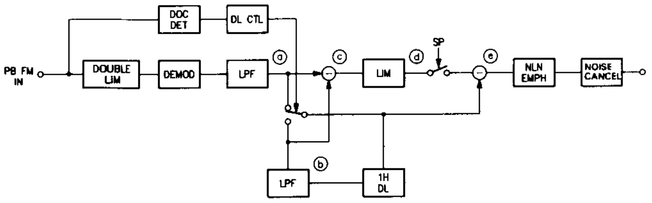


Fig. 3-3-5 Line noise canceller block diagram

Since the extracted noise component contains edge information of the playback luminance signal, the edge component is eliminated by the subsequent noise limiter before being mixed with the original signal.

As a result, the noise component in the original signal is reduced and the S/N ratio can be improved by about 3 dB. The line noise canceller has a function to eliminate the switching noise caused by phase irregularity when the dropout is compensated using the FM signal.

This circuit is also capable of dropout compensation. However, during this period, since the line correlation noise cannot be identified, the noise component which has no line correlation is output as it is.

The line noise canceller functions only during the EP/LP modes and is disabled by cutting off the noise limiter output during the SP mode.

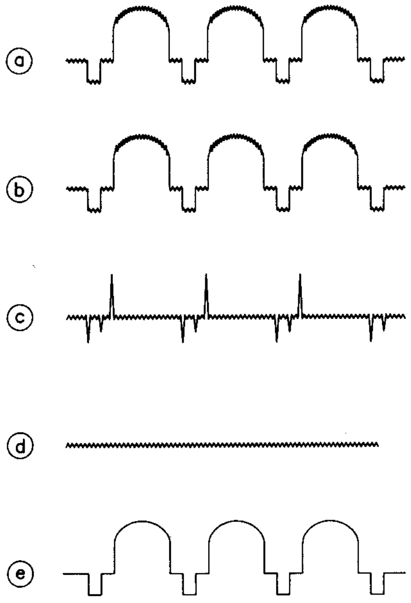


Fig. 3-3-6 Line noise canceller timing chart

11. Y. NR circuit

Fig. 3-3-7 shows a circuit of the recording system.

In recording, this circuit functions for precompensation of decrease in vertical resolution in playback. Waveforms observed at V. rate are shown in Fig. 3-3-8.

When a square waveform is inputted into signal source, the output from ADD (1) is moderate in its rise portion owing to the cyclic low pass filter consisting of ADD (1), 1H DELAY and ATT(1). As this output is larger in amplitude than the original one, ATT(2) corrects it to have the same level as that of the original signal. The output of SUB(1) is high-pass signal which is the difference component between the original and low-pass signals. This high-pass signal is amplified to have a level to compensate the playback signal, and, after its amplitude is limited by the limiter to secure the changeability, it is mixed with the original signal by ADD(2) to be sent as the REC signal.

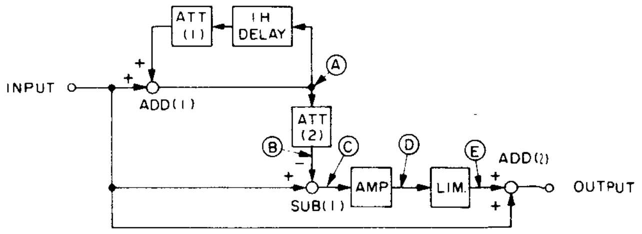


Fig. 3-3-7 YNR block diagram (REC)

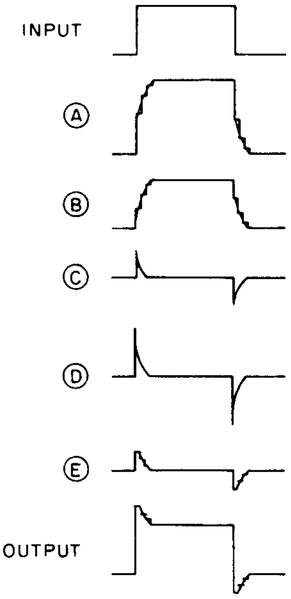


Fig. 3-3-8 YNR timing chart (REC)

Fig. 3-3-9 shows a playback circuit.

This circuit functions to remove noise generated in recording and playback. When P.B. signal containing noise is inputted to the input terminal, the cyclic low-pass filter composed of ADD(1), 1H DELAY and ATT(1) removes the noise, and ADD(1) outputs noiseless signal. If this signal is sent to ADD(2) in the same manner as in recording, output of SUB(1) is high-pass signal containing noise.

Therefore, the circuit is designed so that the signal passes ATT(3) which decrease noise effectively, the limiter to secure changeability, and SUB(2) which adds noise in reversed polarity. Through the above processes, the same output signal, without noise, as the original one can be obtained.

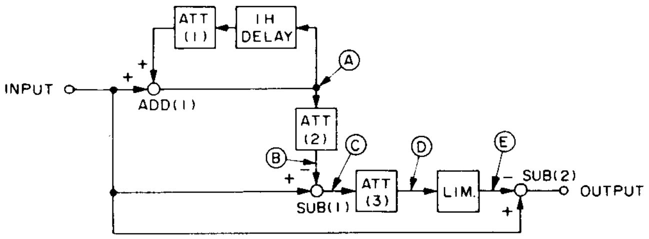


Fig. 3-3-9 YNR block diagram (PB)

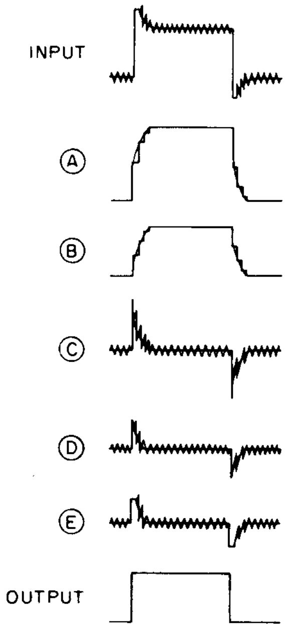


Fig. 3-3-10 YNR timing chart (PB)

12. Advanced noise reduction (ANR) circuit

This is a newly introduced system for improving picture quality in the luminance system. It is contained in the Y module and is comprised of TNR (twin noise reduction) and LPA (linear phase aperture) circuits. The system is able to improve S/N without sacrificing playback signal pulse response.

The noise canceller type system used with earlier equipment subtracted the separated noise component from the playback signal to perform noise reduction. The highpass filter for separating the noise component also separated some of the high frequency signal component, which was removed by a limiter. Subtraction then reduced definition in the picture edges.

The ANR system offers significant improvement in edge response and S/N. Noise reducers NR1 and NR2 are positioned before and after the LPA, thus providing clear and lifelike picture reproduction.

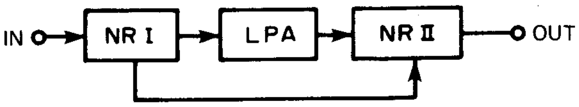


Fig. 3-3-11 ANR Circuit

13. Linear phase aperture (LPA) circuit

This serves to improve pulse response at the video signal edges. It is comprised of delay line, subtractor and adder circuits.

The input signal goes through a 2-step delay line to become waveform C. This is mixed with the orginal signal, gain adjusted to half, and applied to the subtractor. It is mixed with delayed signal B and inverted to become waveform E. After level adjustment, this is mixed with the original signal to yield and output waveform with enhanced edges.

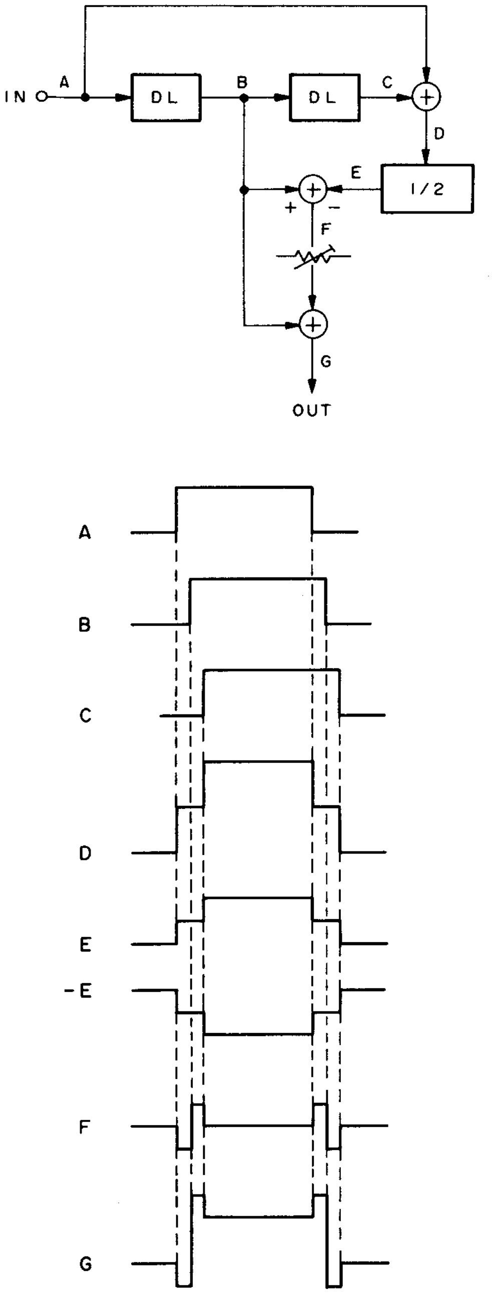

IN
A
DL
B
DL
C
D
E
1/2
+
-
F
G
OUT
A
B
C
D
E
-E
F
G

Fig. 3-3-12 LPA

14. Noise limiter

The noise limiter functions to eliminate the noise in the flat portion of the luminance signal which is conspicuous visually. Since this noise is concentrated at the low level after passing through the HPF, it is extracted by the limiter. The subsequent LPF is provided to match timing which the PB Y signal.

The noise limiter circuit eliminates the noise in the flat portion obtained from the PB Y signal as above before outputting it.

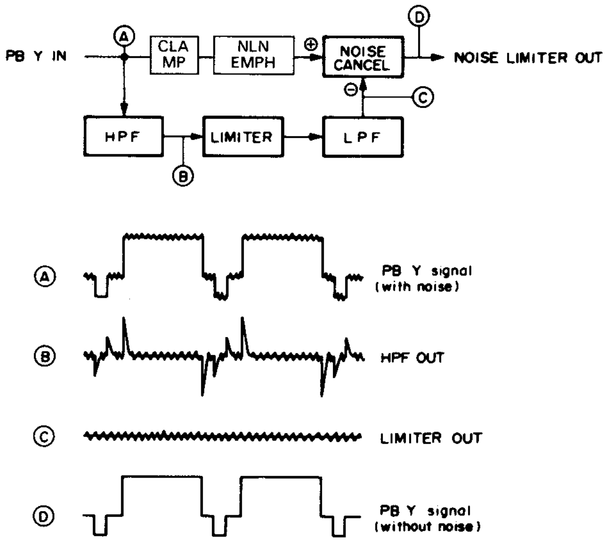

PB Y IN
Ⓐ
CLA MP
NLN EMPH
⊕
NOISE CANCEL
Ⓓ
NOISE LIMITER OUT
⊖
Ⓒ
HPF
LIMITER
LPF
Ⓑ
Ⓐ
PB Y signal (with noise)
Ⓑ
HPF OUT
Ⓒ
LIMITER OUT
Ⓓ
PB Y signal (without noise)

Fig. 3-3-13 Noise limiter

3.3.3 Color signal recording system

1. BPF (bandpass filter) 201

BPF201 is a circuit which extracts the color signal from the input video signal, and has a band width of about ±500 Hz with a center frequency of 3.58 MHz.

2. ACC (automatic chroma level control)

The ACC is a circuit which automatically adjusts the color signal level to the predetermined value.

The ACC extracts only the burst signal, then detects its level before controlling its gain so that its value is constant. In general, if there is no amplitude distortion in the transmission system, the burst signal level is constant. Therefore, it can be said that this circuit eliminates amplitude distortion in the transmission system.

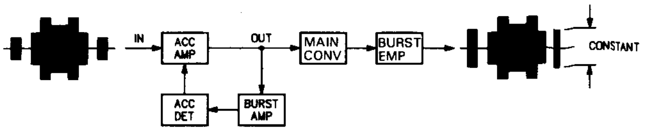

IN
ACC AMP
OUT
MAIN CONV
BURST EMP
CONSTANT
ACC DET
BURST AMP

Fig. 3-3-14 ACC block

3. Main converter

The main converter converts the Fs (3.579545 MHz) color signal into the 40 Fh (629.371 kHz) signal.

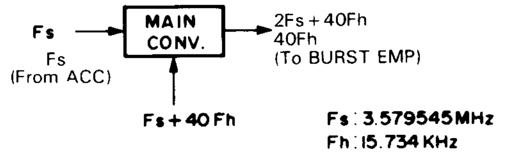

Fs
MAIN CONV.
2Fs + 40Fh
40Fh
(To BURST EMP)
Fs
(From ACC)
Fs + 40 Fh
Fs : 3.579545MHz
Fh : 15.734 KHz

Fig. 3-3-15 Main converter block

In addition to the color signal, the Fs + 40 Fh signal is fed to the main converter which outputs the sum component (2 Fs + 40 Fh signal) and difference component (40 Fh signal).

4. Burst emphasis

In a VHS VCR, to reduce color irregularities and horizontal noise appearing during recording and playback, the burst signal level is boosted by a factor of 2 (6 dB), improving the S/N ratio of the burst signal.

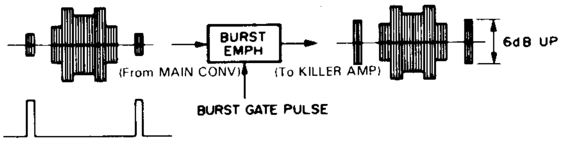

BURST EMPH
(From MAIN CONV)
(To KILLER AMP)
6dB UP
BURST GATE PULSE

Fig. 3-3-16 Burst emphasis block

5. Color killer

The color killer circuit cuts the color signal when the B/W TV signal is input.

The input burst signal is brought in sync and caused to oscillate with the 3.58 MHz VCO (voltage-controlled oscillator). If it locks and oscillates, it is a color TV signal. Whether it is brought in sync and caused to oscillate can be judged by phase-detecting the 3.58 MHz VCO output whose phase is shifted by 90° and the input burst signal again.

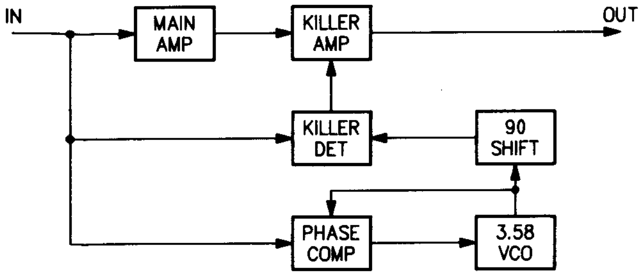

IN
MAIN AMP
KILLER AMP
OUT
KILLER DET
90 SHIFT
PHASE COMP
3.58 VCO

Fig. 3-3-17 Color killer block

6. LPF (lowpass filter)

The output of the main converter contains the sum component 2 Fs + 40 Fh signal as well as the necessary difference component down-converted 40 Fh color signal. Therefore, the unnecessary sum component is eliminated by the LPF.

7. APC (automatic phase control)

In the APC circuit, the burst signal of the input reference color signal is phase-compared with the comparison output signal from the 3.58 MHz VCO using the burst gate pulse in order to control the 3.58 MHz VCO. For this reason, the 3.58 MHz signal which is in phase with the input color signal is input to the sub-converter.

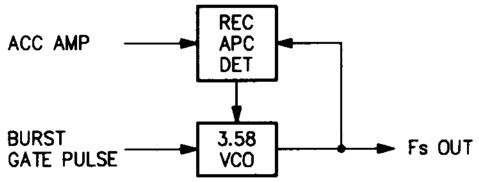

ACC AMP
REC APC DET
BURST GATE PULSE
3.58 VCO
Fs OUT

Fig. 3-3-18 REC APC block

8. AFC (automatic frequency control)

The AFC circuit:

a. generates the 40 Fh signal (629.36 kHz).

b. shifts the phase of the 40 Fh signal by 90° every 1H.

c. corrects the phase using the horizontal sync signal.
Refer to Fig. 3-3-19.

The horizontal sync signal fed from the Y circuit is eliminated from the 1/2H sync signal of the vertical sync signal portion by the 1/2H pulse killer before being fed to the AFC detector and phase shift section.

The AFC detector is a phase comparator in the AFC loop, whose reference signal is a horizontal sync signal and comparison signal is the Fh signal which is obtained by counting down the 320 Fh VCO output to 1/320.

The error output from the AFC detector is fed to the 320 Fh VCO, which oscillates at 320 Fh (5.03488 MHz). This 320 Fh signal is fed to the phase shift section, to which the color rot signal and the horizontal sync signal are also fed.

The output from the phase shift section is 40 Fh, and the phase of the signal recorded by Ch-1 video head leads by 90° whereas the phase of the signal recorded by Ch-2 video head lags by 90°

This 40 Fh signal is fed to the sub-converter as the AFC output.

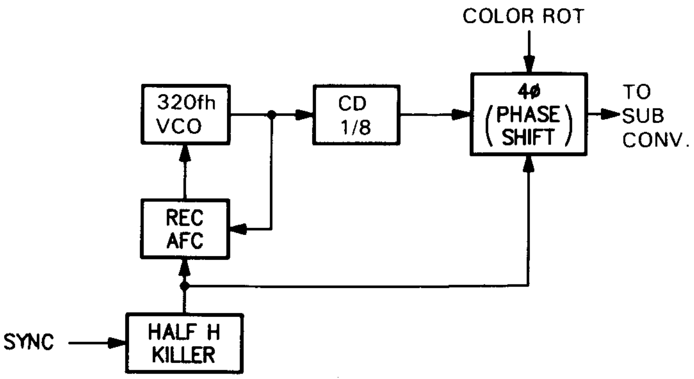

COLOR ROT
320fh VCO
CD 1/8
4φ (PHASE SHIFT)
TO SUB CONV.
REC AFC
SYNC
HALF H KILLER

Fig. 3-3-19 REC AFC block

9. Sub-converter and T201 (BPF)

The sub-converter converts the input Fs (3.579545 MHz) signal into the Fs + 40 Fh signal. The 40 Fh signal is fed to the sub-converter as well as the Fs signal, which outputs the sum component Fs +40 Fh signal and difference component Fs – 40 Fh signal.

T201 extracts the necessary Fs + 40 Fh signal, and cuts off the unnecessary Fs – 40 Fh signal.

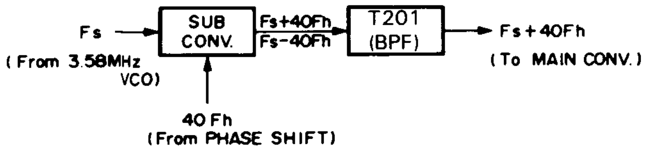


Fig. 3-3-20 Sub-converter and T201

10. Burst gate pulse generator

The 320 Fh signal and the horizontal sync signal are fed to the burst gate pulse generator. The burst gate pulse is formed by counting the 320 Fh signal with the horizontal sync signal as reference.

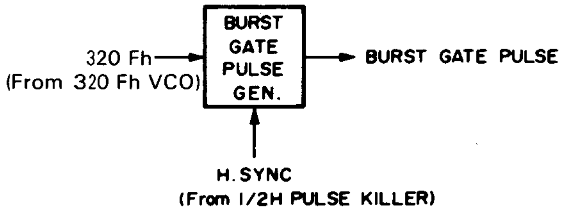


Fig. 3-3-21 Burst gate pulse generator

3.3.4 Color signal playback system

1. LPF (lowpass filter)

The LPF extracts the down-converted color signal from the playback FM signal and attenuates the unnecessary luminance signal component.

2. ACC

As in recording, the ACC extracts the burst signal, then controls the gain of the color signal so that its level is constant.

3. Main converter and BPF201

The FS + 40 Fh signal is sent to the main converter from the sub-converter just as in recording. When the output from the main converter is passed through BPF201, the original Fs color signal is recovered from the 40 Fh signal.

The actual played-back color signal contains fluctuations (in frequency and phase) resulting from variations in tape speed, irregular speeds of the video heads, and tape expansion/contraction, the correction of which is described in the description of the APC (automatic phase control) and AFC (automatic frequency control).

4. Burst de-emphasis

The burst signal which has been boosted by 6 dB during recording is restored into the original level.

5. 1H delay line

Since the phase-shifted playback down-converted color signal has the opposite relation to the signal 1H horizontal period before as far as the crosstalk from the adjacent track is concerned, if the signal passed through the 1H delay line is added, the main signal will have twice the level with the result that the crosstalk components cancel each other and are virtually nullified.

6. Color killer

When the playback signal is a B/W signal, the color killer cuts the color signal output. The operation of this circuit is the same as that during recording.

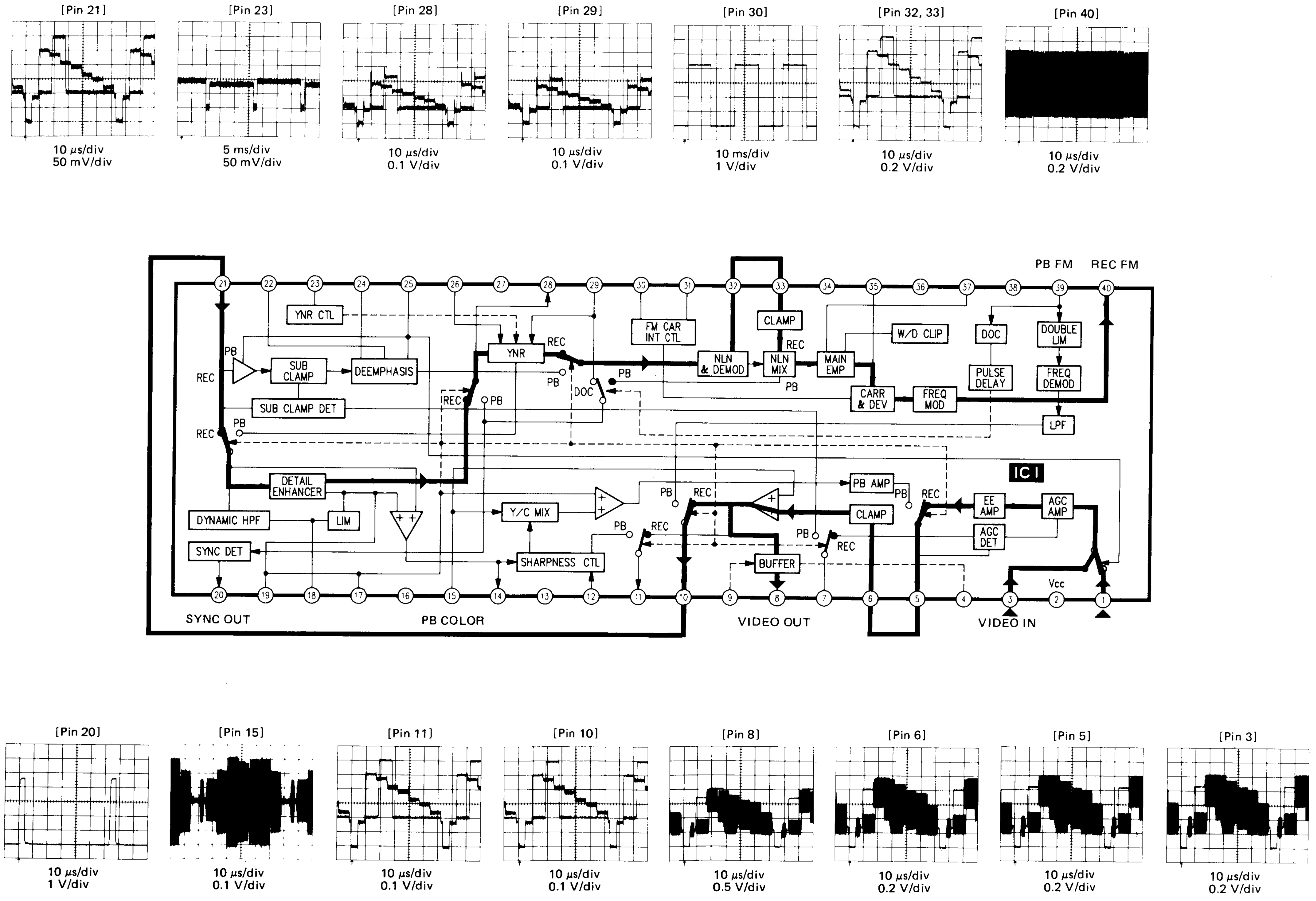
7. Correction of frequency and phase fluctuation (APC and AFC)

When the played-back down-converted color burst signal is Fsc', it is played back as $\mathrm{Fsc}' = 40\ \mathrm{Fh}' \pm \Delta f$, where Fh' indicates frequency fluctuations due to variation in tape speed and is corrected by the AFC circuit, and $\pm \Delta f$ indicates fluctuations in phase due to variation in video head speed or tape stretch/compression, which are corrected by the APC circuit.

In the normal playback state, only correction by the APC circuit is performed and AFC circuit goes into operation only when the lock range of the APC is exceeded, serving to bring it within the lock range of the APC quickly.

—NOTE—

3.3.5 IC1 Y signal waveform in the REC mode


[Pin 21] 10 µs/div 50 mV/div

[Pin 23] 5 ms/div 50 mV/div

[Pin 28] 10 µs/div 0.1 V/div

[Pin 29] 10 µs/div 0.1 V/div

[Pin 30] 10 ms/div 1 V/div

[Pin 32, 33] 10 µs/div 0.2 V/div

[Pin 40] 10 µs/div 0.2 V/div

[Pin 20] 10 µs/div 1 V/div

[Pin 15] 10 µs/div 0.1 V/div

[Pin 11] 10 µs/div 0.1 V/div

[Pin 10] 10 µs/div 0.1 V/div

[Pin 8] 10 µs/div 0.5 V/div

[Pin 6] 10 µs/div 0.2 V/div

[Pin 5] 10 µs/div 0.2 V/div

[Pin 3] 10 µs/div 0.2 V/div

PB FM
REC FM
YNR CTL
YNR
REC
PB
SUB CLAMP
DEEMPHASIS
SUB CLAMP DET
FM CAR INT CTL
NLN & DEMOD
NLN MIX
CLAMP
MAIN EMP
W/D CLIP
DOC
DOUBLE LIM
PULSE DELAY
FREQ DEMOD
CARR & DEV
FREQ MOD
LPF
DETAIL ENHANCER
DYNAMIC HPF
LIM
SYNC DET
Y/C MIX
SHARPNESS CTL
PB AMP
CLAMP
BUFFER
EE AMP
AGC AMP
AGC DET
IC1
Vcc
SYNC OUT
PB COLOR
VIDEO OUT
VIDEO IN

Fig. 3-3-22 IC1 Y signal waveform (REC)

3.3.6 IC1 Y signal waveform in the PB mode

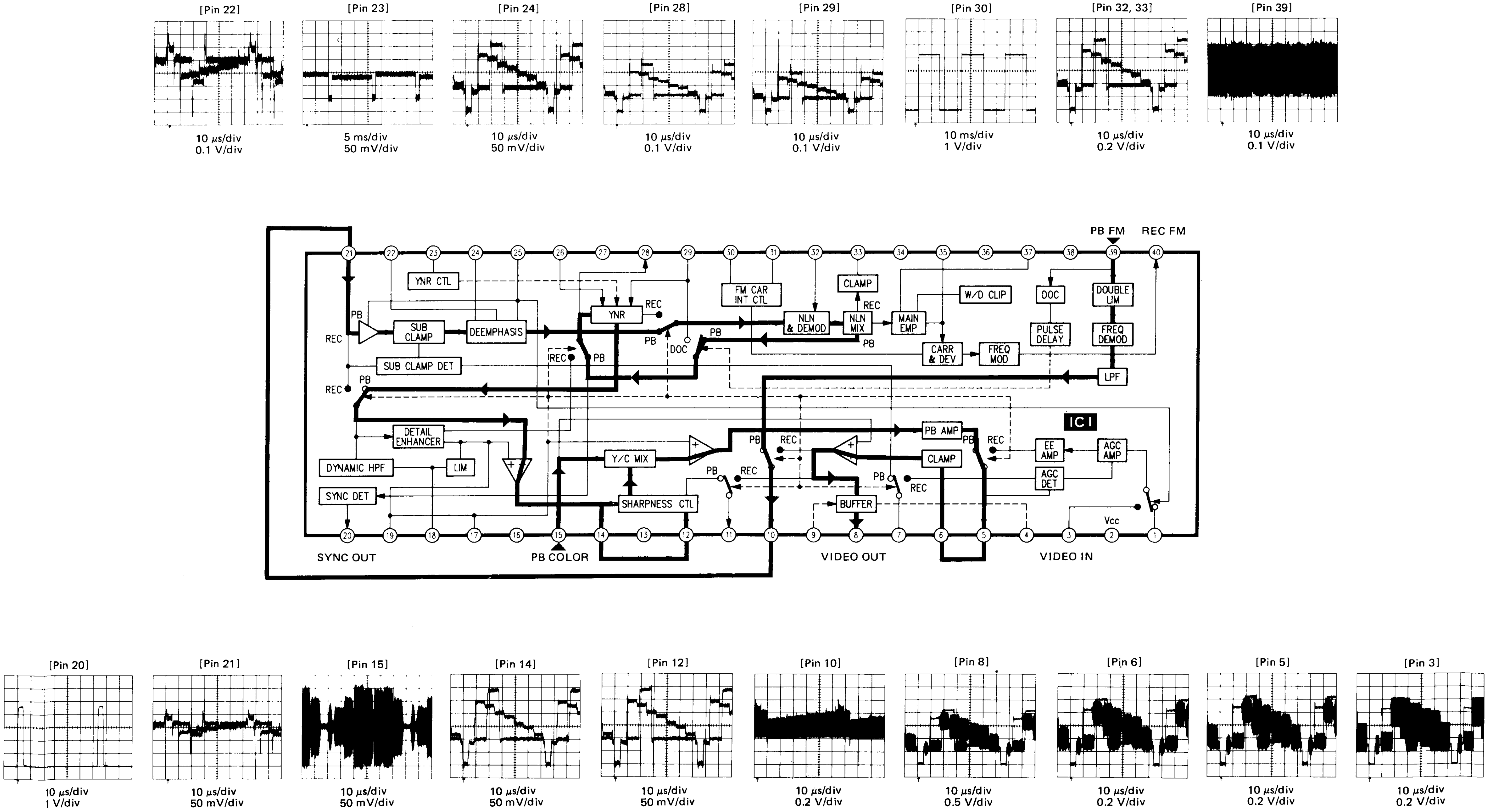

[Pin 22]
10 μs/div
0.1 V/div
[Pin 23]
5 ms/div
50 mV/div
[Pin 24]
10 μs/div
50 mV/div
[Pin 28]
10 μs/div
0.1 V/div
[Pin 29]
10 μs/div
0.1 V/div
[Pin 30]
10 ms/div
1 V/div
[Pin 32, 33]
10 μs/div
0.2 V/div
[Pin 39]
10 μs/div
0.1 V/div
PB FM
REC FM
YNR CTL
YNR
REC
PB
SUB CLAMP
DEEMPHASIS
SUB CLAMP DET
DOC
FM CAR INT CTL
NLN & DEMOD
NLN MIX
CLAMP
MAIN EMP
W/D CLIP
CARR & DEV
FREQ MOD
DOC
PULSE DELAY
DOUBLE LIM
FREQ DEMOD
LPF
IC1
DETAIL ENHANCER
DYNAMIC HPF
LIM
SYNC DET
Y/C MIX
SHARPNESS CTL
PB AMP
CLAMP
BUFFER
EE AMP
AGC AMP
AGC DET
Vcc
SYNC OUT
PB COLOR
VIDEO OUT
VIDEO IN
[Pin 20]
10 μs/div
1 V/div
[Pin 21]
10 μs/div
50 mV/div
[Pin 15]
10 μs/div
50 mV/div
[Pin 14]
10 μs/div
50 mV/div
[Pin 12]
10 μs/div
50 mV/div
[Pin 10]
10 μs/div
0.2 V/div
[Pin 8]
10 μs/div
0.5 V/div
[Pin 6]
10 μs/div
0.2 V/div
[Pin 5]
10 μs/div
0.2 V/div
[Pin 3]
10 μs/div
0.2 V/div

Fig. 3-3-23 IC1 Y signal waveform (PB)

3.3.7 IC201 Color signal waveform in the REC mode

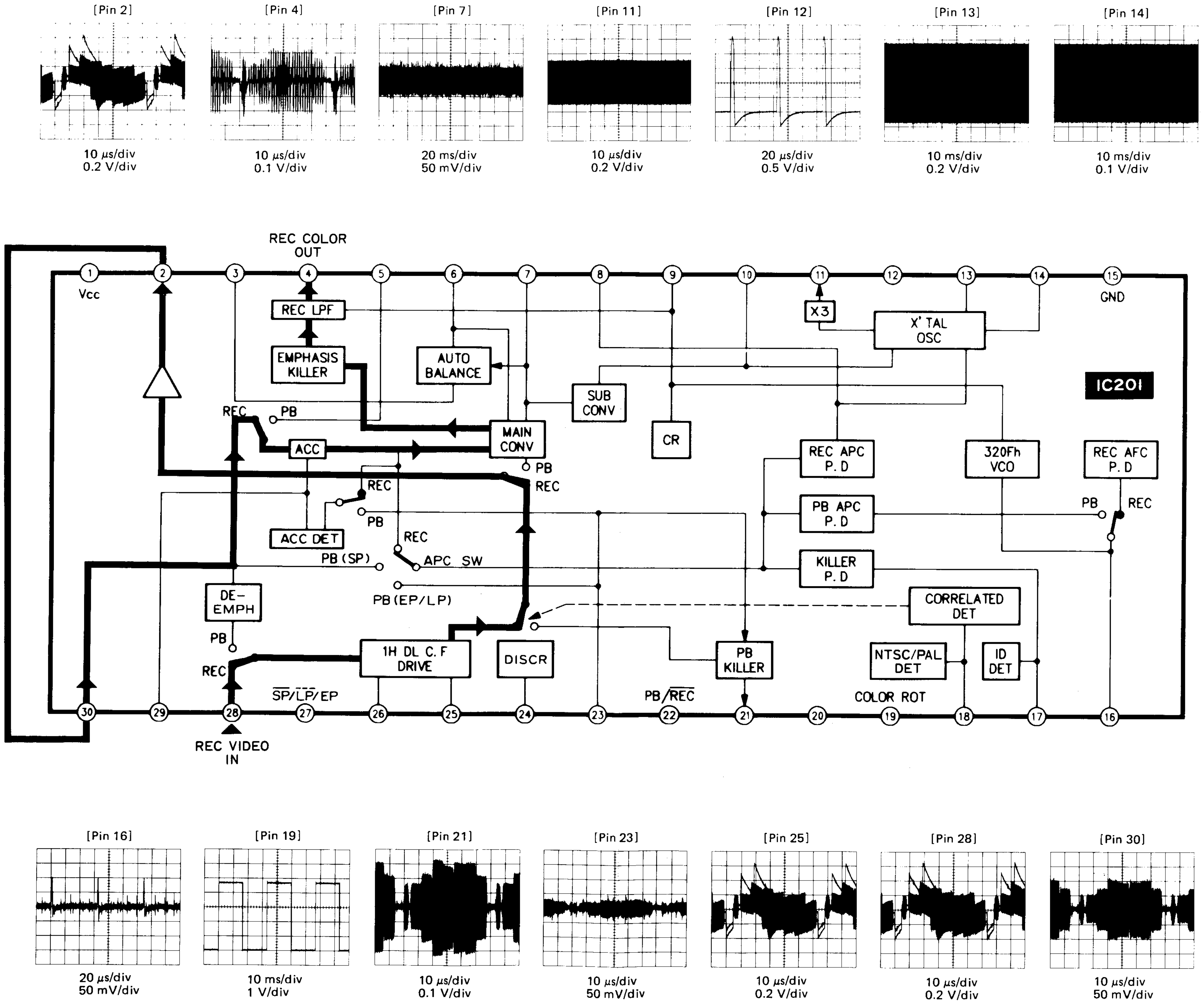

[Pin 2]
10 μs/div
0.2 V/div
[Pin 4]
10 μs/div
0.1 V/div
[Pin 7]
20 ms/div
50 mV/div
[Pin 11]
10 μs/div
0.2 V/div
[Pin 12]
20 μs/div
0.5 V/div
[Pin 13]
10 ms/div
0.2 V/div
[Pin 14]
10 ms/div
0.1 V/div
REC COLOR OUT
Vcc
GND
REC LPF
EMPHASIS KILLER
AUTO BALANCE
X3
X' TAL OSC
IC201
SUB CONV
MAIN CONV
CR
REC
PB
ACC
ACC DET
REC APC P. D
PB APC P. D
KILLER P. D
320Fh VCO
REC AFC P. D
PB (SP)
APC SW
PB (EP/LP)
DE-EMPH
CORRELATED DET
1H DL C. F DRIVE
DISCR
PB KILLER
NTSC/PAL DET
ID DET
SP/LP/EP
PB/REC
COLOR ROT
REC VIDEO IN
[Pin 16]
20 μs/div
50 mV/div
[Pin 19]
10 ms/div
1 V/div
[Pin 21]
10 μs/div
0.1 V/div
[Pin 23]
10 μs/div
50 mV/div
[Pin 25]
10 μs/div
0.2 V/div
[Pin 28]
10 μs/div
0.2 V/div
[Pin 30]
10 μs/div
50 mV/div

Fig. 3-3-24 IC201 Color signal waveform (REC)

3.3.8 IC201 Color signal waveform in the PB mode

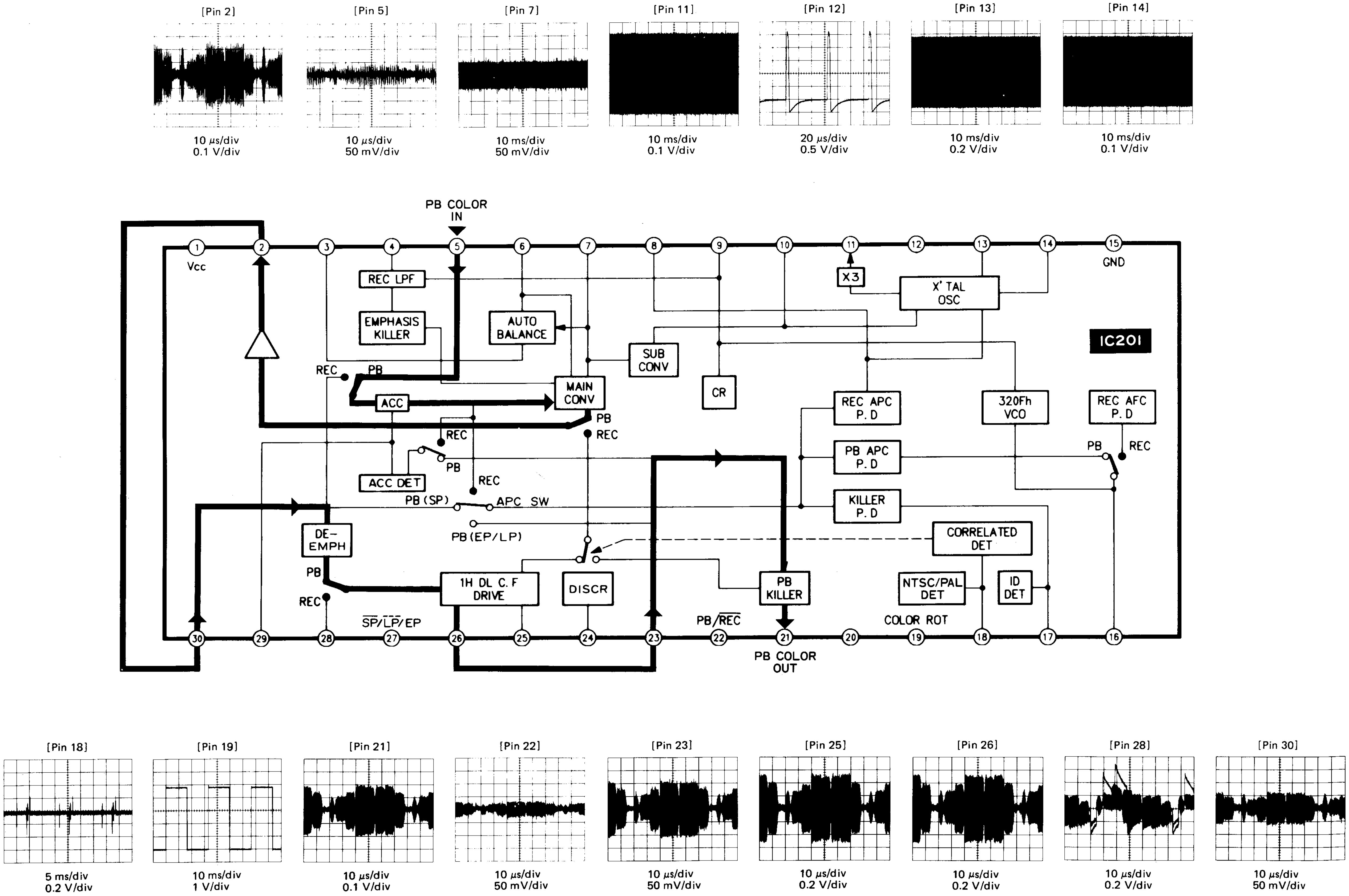
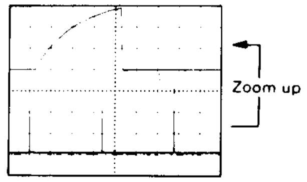

[Pin 2]
10 µs/div
0.1 V/div
[Pin 5]
10 µs/div
50 mV/div
[Pin 7]
10 ms/div
50 mV/div
[Pin 11]
10 ms/div
0.1 V/div
[Pin 12]
20 µs/div
0.5 V/div
[Pin 13]
10 ms/div
0.2 V/div
[Pin 14]
10 ms/div
0.1 V/div
PB COLOR IN
Vcc
GND
IC201
REC LPF
EMPHASIS KILLER
AUTO BALANCE
SUB CONV
CR
X3
X'TAL OSC
MAIN CONV
ACC
ACC DET
REC
PB
PB (SP)
APC SW
PB (EP/LP)
DE-EMPH
1H DL C.F DRIVE
DISCR
REC APC P.D
PB APC P.D
KILLER P.D
320Fh VCO
REC AFC P.D
CORRELATED DET
NTSC/PAL DET
ID DET
PB KILLER
SP/LP/EP
PB/REC
COLOR ROT
PB COLOR OUT
[Pin 18]
5 ms/div
0.2 V/div
[Pin 19]
10 ms/div
1 V/div
[Pin 21]
10 µs/div
0.1 V/div
[Pin 22]
10 µs/div
50 mV/div
[Pin 23]
10 µs/div
50 mV/div
[Pin 25]
10 µs/div
0.2 V/div
[Pin 26]
10 µs/div
0.2 V/div
[Pin 28]
10 µs/div
0.2 V/div
[Pin 30]
10 µs/div
50 mV/div

Fig. 3-3-25 IC201 Color signal waveform (PB)

3.4 SERVO CIRCUIT

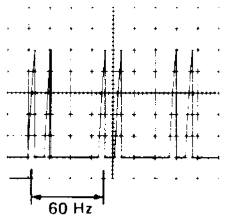
3.4.1 Block diagram and pin function of IC401

[Pin 6]



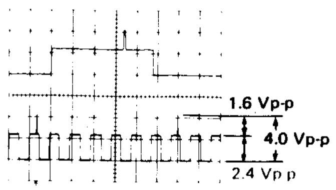
[3.0 Vp-p, 60 Hz]
5 ms/div, 1 V/div

[Pin 7]



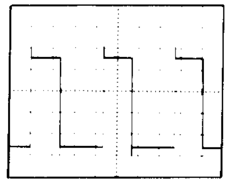
[2.6 Vp-p, 60 Hz]
5 ms/div, 0.5 Vdiv

[Pin 9]



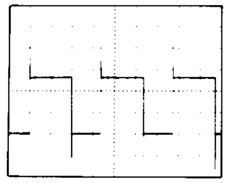
[4.0 Vp-p, PG: 30 Hz,
FG:210 Hz]
5 ms/div, 2 V/div

[Pin 29]



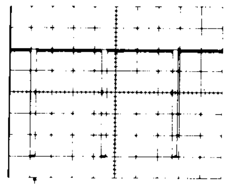
[REC mode:
6.0 Vp-p, 30 Hz]
10 ms/div, 1 V/div

[Pin 30]



[REC mode:
6.5 Vp-p, 30 Hz]
10 ms/div, 1 V/div

[Pin 47]



[5.2 Vp-p, 60 Hz]
5 ms/div, 1 V/div

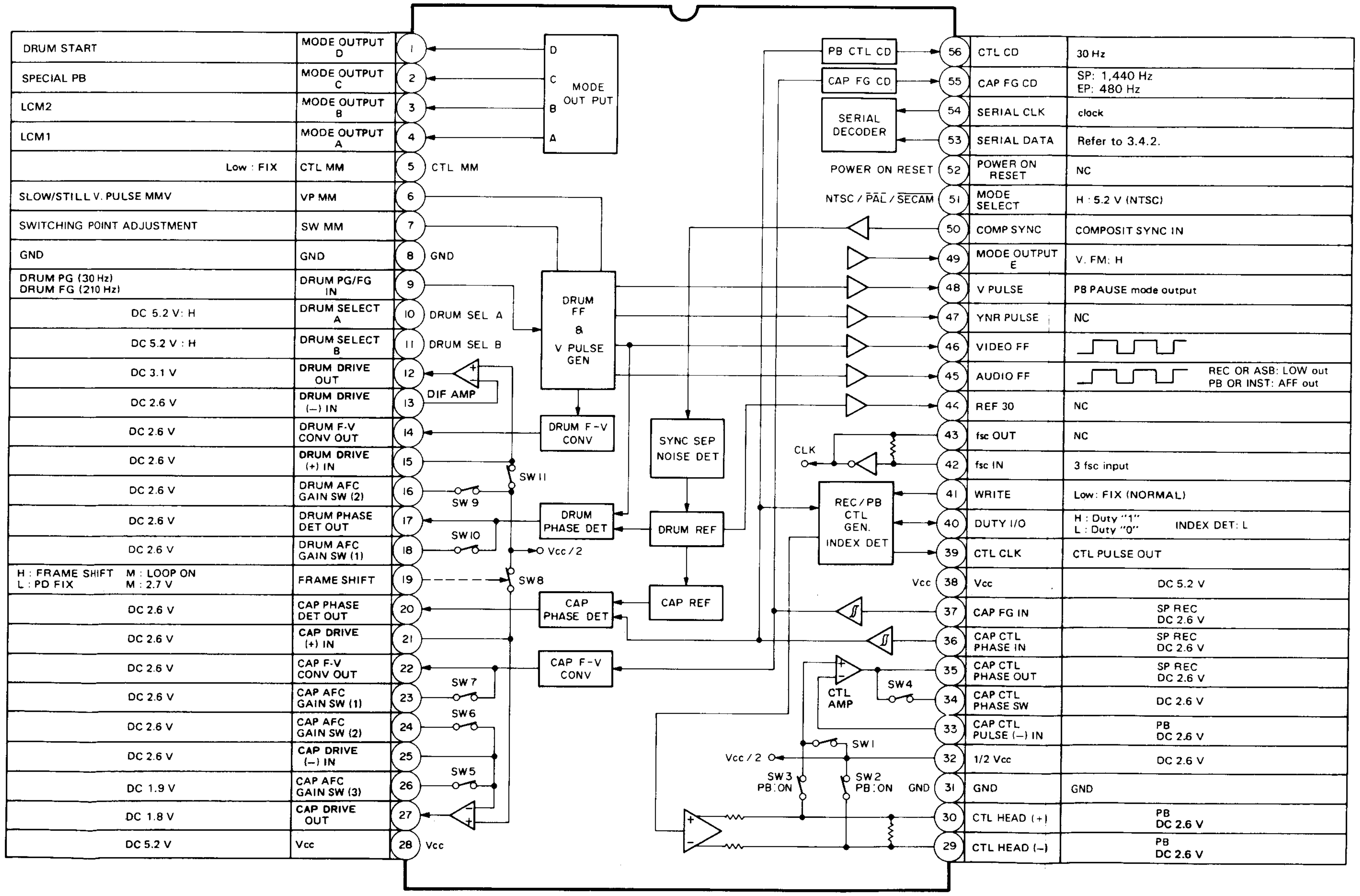
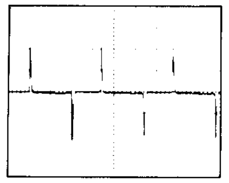

MODE OUT PUT
D
C
B
A
CTL MM
GND
DRUM SEL A
DRUM SEL B
DIF AMP
DRUM FF & V PULSE GEN
DRUM F-V CONV
SW 11
SW 9
SW 10
DRUM PHASE DET
Vcc/2
SW8
CAP PHASE DET
CAP F-V CONV
SW 7
SW6
SW5
Vcc
SYNC SEP NOISE DET
DRUM REF
CAP REF
PB CTL CD
CAP FG CD
SERIAL DECODER
POWER ON RESET
NTSC / PAL / SECAM
CLK
REC/PB CTL GEN. INDEX DET
Vcc
CTL AMP
SW4
SW1
Vcc/2
SW3 PB:ON
SW2 PB:ON
GND

Fig. 3-4-1 IC401 block diagram and pin function

Function	Pin name	Pin
DRUM START	MODE OUTPUT D	1
SPECIAL PB	MODE OUTPUT C	2
LCM2	MODE OUTPUT B	3
LCM1	MODE OUTPUT A	4
Low : FIX	CTL MM	5
SLOW/STILL V. PULSE MMV	VP MM	6
SWITCHING POINT ADJUSTMENT	SW MM	7
GND	GND	8
DRUM PG (30 Hz) DRUM FG (210 Hz)	DRUM PG/FG IN	9
DC 5.2 V: H	DRUM SELECT A	10
DC 5.2 V : H	DRUM SELECT B	11
DC 3.1 V	DRUM DRIVE OUT	12
DC 2.6 V	DRUM DRIVE (–) IN	13
DC 2.6 V	DRUM F-V CONV OUT	14
DC 2.6 V	DRUM DRIVE (+) IN	15
DC 2.6 V	DRUM AFC GAIN SW (2)	16
DC 2.6 V	DRUM PHASE DET OUT	17
DC 2.6 V	DRUM AFC GAIN SW (1)	18
H : FRAME SHIFT M : LOOP ON L : PD FIX M : 2.7 V	FRAME SHIFT	19
DC 2.6 V	CAP PHASE DET OUT	20
DC 2.6 V	CAP DRIVE (+) IN	21
DC 2.6 V	CAP F-V CONV OUT	22
DC 2.6 V	CAP AFC GAIN SW (1)	23
DC 2.6 V	CAP AFC GAIN SW (2)	24
DC 2.6 V	CAP DRIVE (–) IN	25
DC 1.9 V	CAP AFC GAIN SW (3)	26
DC 1.8 V	CAP DRIVE OUT	27
DC 5.2 V	Vcc	28

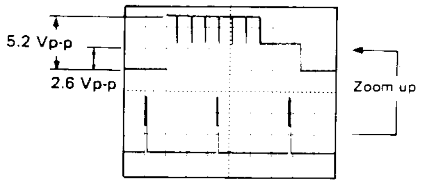
Pin	Pin name	Function
56	CTL CD	30 Hz
55	CAP FG CD	SP: 1,440 Hz EP: 480 Hz
54	SERIAL CLK	clock
53	SERIAL DATA	Refer to 3.4.2.
52	POWER ON RESET	NC
51	MODE SELECT	H : 5.2 V (NTSC)
50	COMP SYNC	COMPOSIT SYNC IN
49	MODE OUTPUT E	V. FM: H
48	V PULSE	PB PAUSE mode output
47	YNR PULSE	NC
46	VIDEO FF	⎍⎍
45	AUDIO FF	⎍⎍ REC OR ASB: LOW out PB OR INST: AFF out
44	REF 30	NC
43	fsc OUT	NC
42	fsc IN	3 fsc input
41	WRITE	Low: FIX (NORMAL)
40	DUTY I/O	H : Duty "1" L : Duty "0" INDEX DET: L
39	CTL CLK	CTL PULSE OUT
38	Vcc	DC 5.2 V
37	CAP FG IN	SP REC DC 2.6 V
36	CAP CTL PHASE IN	SP REC DC 2.6 V
35	CAP CTL PHASE OUT	SP REC DC 2.6 V
34	CAP CTL PHASE SW	DC 2.6 V
33	CAP CTL PULSE (–) IN	PB DC 2.6 V
32	1/2 Vcc	DC 2.6 V
31	GND	GND
30	CTL HEAD (+)	PB DC 2.6 V
29	CTL HEAD (–)	PB DC 2.6 V

[Pin 35, 36]



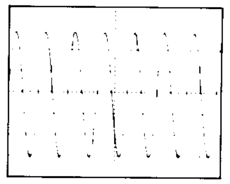
[PB mode:
2.6 Vp-p, 30 Hz]
10 ms/div, 0.5 V/div]

[Pin 48]



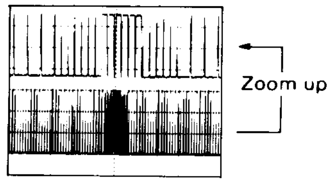
[5.2 Vp-p, 60 Hz]
5 ms/div, 2 V/div

[Pin 37]



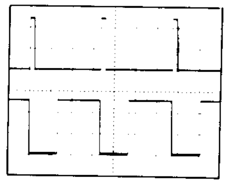
(37 pin)
[2.7 Vp-p, 1.42 kHz]
0.5 ms/div, 0.5 V/div

[Pin 50]



[4.2 Vp-p COMPOSITE
SYNC IN]
0.5 ms/div, 2 V/div

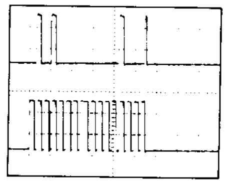
[Pin 39]



(REC)
[REC mode:
4.9 Vp-p, 30 Hz]
10 ms/div, 2 V/div

(PB)
[PB mode:
5.0 Vp-p, 30 Hz]
10 ms/div, 2 V/div

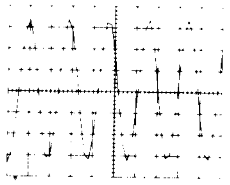
[Pin 53, 54]



(Pin 53)
[Pin 50: 4.7 Vp-p]
50 µs/div, 2 V/div

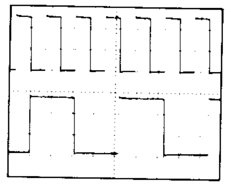
(Pin 54)
[Pin 51: 4.7 Vp-p]
50 µs/div, 2 V/div

[Pin 42]



[0.5 Vp-p, 3.58 MHz]
50 ns/div, 0.1 V/div

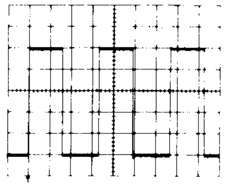
[Pin 55]



[SP mode:
5.1 Vp-p, 1.428 Hz]
0.5 ms/div, 2 V/div

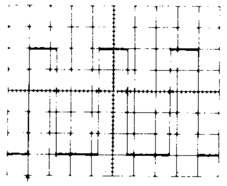
[EP mode:
5.3 Vp-p, 476 Hz]
0.5 ms/div, 2 V/div

[Pin 46]



[5.2 Vp-p, 30 Hz]
10 ms/div, 1 V/div

[Pin 56]



[5.5 Vp-p, 30 Hz]
10 ms/div, 1 V/div

SW positions

- SW1 – SW3

	REC	PB
SW1	ON	OFF
SW2	OFF	ON
SW3	OFF	ON

- SW4
  TAPE SPEED × 1: ON

- SW5
  SLOW STILL : ON

- SW6, SW7

SW6	SW7	NTSC SP	NTSC EP
OFF	OFF	SLOW	SLOW, X1
OFF	ON	X1	X3
ON	OFF	–	X13
ON	ON	X7	X21

- SW8
  CAP P/D FIX: ON

- SW9
  SPECIAL PB→ PB : ON

- SW10
  SPECIAL PB : ON

- SW11
  DRUM P/D FIX: ON

3.4.2 Serial data-1

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0			
													0	0	0	SP		
													0	1	0	LP		
													1	0	0	EP		
										0	0	0			0	REC		
									0	0	1	0			0	ASBL		
									1	0	1	0			0	ASBL (P. BAR ON)		
									0	1	0	0			0	INST		
									1	1	0	0			0	INST (P. BAR ON)		
									0	0	0	1			0	PB VP OFF		
									0	0	1	1			0	PB VP ON FIX/FIX		
									0	1	0	1			0	PB VP ON FIX/VAR		
									0	1	1	1			0	PB VP ON VAR/VAR		
									1	0	0	1			0	PB MONITOR OFF VP. out = H		
									1	0	1	1			0	PB MONITOR OFF VP. out = M		
									1	1	0	1			0	PB MONITOR OFF VP. out = M		
									1	1	1	1			0	PB MONITOR OFF VP. out = M		
								0				1			0	DRUM PD ON		
								1				1			0	DRUM PD OFF		
				0	0	0	0					1			0	SP× 1	LP× 1	EP× 1
				0	0	0	1					1			0	SP× 2	LP× 2	EP× 2
				0	0	1	0					1			0	SP× 3	LP× 3	EP× 3
				0	1	0	0					1			0	SP× 5	LP× 5	EP× 7
				0	1	1	0					1			0	SP× 7	LP× 7	EP× 13
				1	0	0	0					1			0	SP× 11	LP× 13	EP× 21
				1	0	1	0					1			0	SP× 13	LP× 21	EP× 31
				1	1	1	0					1			0	SLOW CAP P/D FIX		
				1	1	1	1					1			0	SLOW CAP P/D FIX, DRUM P/D FIX		
			0												0	FWD		
			1												0	REV		
0	0	0													0	DUTY DET. MODE		
0	0	1													0	DUTY DET. MODE INDEX REC FF RESET		
0	1	0													0	VISS MODE		
0	1	1													0	VISS MODE INDEX REC FF RESET		
1	0	0													0	VISS MODE INDEX DET FF RESET		
1	0	1													0	VISS MODE INDEX DET FF RESET, INDEX REC FF RESET		
1	1	0													0	VISS MODE INDEX REC		
1	1	1													0	ERASE MODE INDEX REC FF RESET		

Table 3-4-1 Serial data-1N

3.4.3 Serial data-2

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0					
	*	*	*	*	*	*	*						1	1	1	PB TRACKING DATA				
																MODE OUT CTL				
																A	B	C	D	E
0									0			0	1	1	1					N. DET
0									0			1	1	1	1					×2
0									1			0	1	1	1					0
0									1			1	1	1	1					1
0								0		0	0		1	1	1	SP $\overline{\times 2}$	SP ×2	$\overline{\text{SP}}$ $\overline{\times 2}$	$\overline{\text{SP}}$ ×2	
0								0		0	1		1	1	1	SP	$\overline{\text{SP}}$	$\overline{\text{SP}}$ $\overline{\times 2}$	$\overline{\text{SP}}$ X2	
0								0		1	0		1	1	1	SP	$\overline{\text{SP}}$	SP ×2	$\overline{\text{SP}}$ ×2	
0								0		1	1		1	1	1	OSC-H	CAP-REF	CTL DELAY COUNTER	CTL DELAY MM TRG.	
0								1		0	0		1	1	1	SP	$\overline{\text{SP}}$	0	0	
0								1		0	1		1	1	1	SP	$\overline{\text{SP}}$	0	1	
0								1		1	0		1	1	1	SP	$\overline{\text{SP}}$	1	0	
0								1		1	1		1	1	1	SP	$\overline{\text{SP}}$	1	1	
1								0	0	0	0	0	1	1	1	0	0	0	0	0
1								0	0	0	0	1	1	1	1	0	0	0	0	1
1								0	0	0	1	0	1	1	1	0	0	0	1	0
1								0	0	0	1	1	1	1	1	0	0	0	1	1
1								0	0	1	0	0	1	1	1	0	0	1	0	0
1								0	0	1	0	0	1	1	1	0	0	1	0	0
1								0	0	1	0	0	1	1	1	0	0	1	0	0
1								1	1	0	1	1	1	1	1	1	1	0	1	1
1								1	1	1	0	0	1	1	1	1	1	1	0	0
1								1	1	1	0	1	1	1	1	1	1	1	0	1
1								1	1	1	1	0	1	1	1	1	1	1	1	0
1								1	1	1	1	1	1	1	1	1	1	1	1	1
													0	1	1	REC CTL DELAY DATA				
											0	0	0	1	1	REF SEL NOR				
											0	1	0	1	1	REF SEL EXT. REF.				
											1	0	0	1	1	REF SEL FIELD DET.				
											1	1	0	1	1	REF SEL EXT. REF ⊕ FIELD DET.				
1								0	0				0	1	1	CLOCK 3fsc				
0								1	1				0	1	1	CLOCK fsc				
										0			0	1	1	VP SEL NOR				
										1			0	1	1	VP SEL ⊕ 6H				
												0	0	0	1	TEST MODE				

Table 3-4-2 Serial data-2N

3.4.4 Servo timing chart

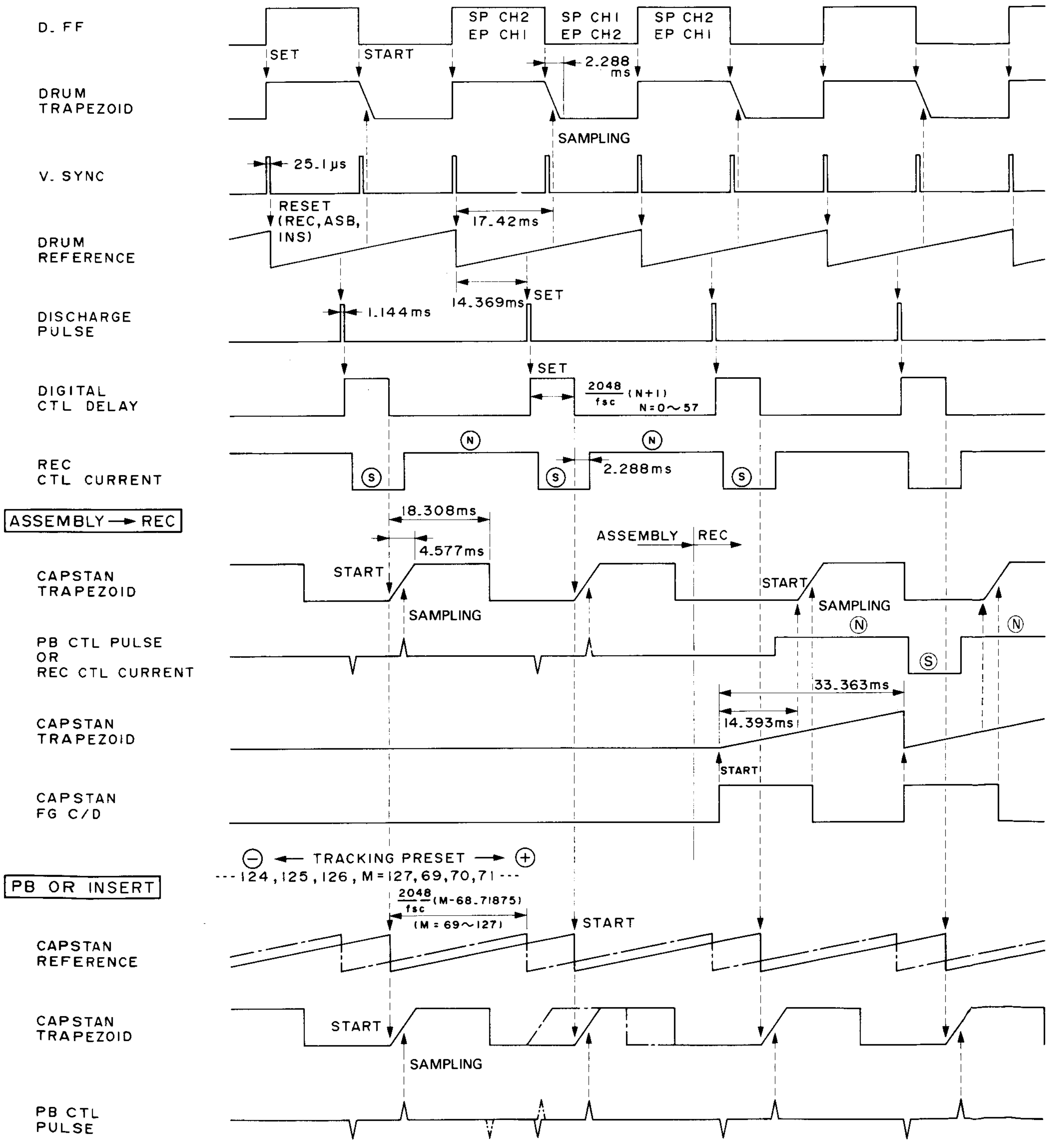

D. FF
SP CH2
EP CH1
SP CH1
EP CH2
SP CH2
EP CH1
SET
START
2.288 ms
DRUM TRAPEZOID
SAMPLING
V. SYNC
25.1 μs
RESET (REC, ASB, INS)
17.42ms
DRUM REFERENCE
14.369ms
SET
DISCHARGE PULSE
1.144ms
DIGITAL CTL DELAY
SET
$\frac{2048}{fsc}$ (N+1) N=0~57
REC CTL CURRENT
Ⓝ
Ⓢ
2.288ms
ASSEMBLY → REC
18.308ms
4.577ms
ASSEMBLY
REC
CAPSTAN TRAPEZOID
START
SAMPLING
PB CTL PULSE OR REC CTL CURRENT
33.363ms
14.393ms
CAPSTAN TRAPEZOID
START
CAPSTAN FG C/D
⊖ ← TRACKING PRESET → ⊕
--- 124, 125, 126, M=127, 69, 70, 71 ---
PB OR INSERT
$\frac{2048}{fsc}$(M-68.71875)
(M = 69~127)
START
CAPSTAN REFERENCE
CAPSTAN TRAPEZOID
START
SAMPLING
PB CTL PULSE

Fig. 3-4-4 Servo timing chart

3.4.5 Drum servo

- The drum servo circuit functions to regulate speed and phase of the rotating head drum. In recording, the reference signal is taken from the input vertical sync signal, while the comparison signal is the drum flipflop. The vertical sync signal is recorded at the position 6.5 H from the head switching point.

During playback, drum speed is controlled to maintain a fixed rate using a crystal clock (3 fsc) reference and the drum flipflop signals.

Mode	Phase Servo		Speed Servo
	Reference Signal	Comparison Signal	
REC	X'TAL 30 H (V. sync reset)	DRUM FF 30 Hz	DRUM FG 240 Hz
PB	X'TAL 30 Hz		
ASSEMBLY	X'TAL 30 Hz (V. sync reset)		
INSERT	X'TAL 30 Hz (V. sync reset)		
SEARCH	fh COMPENSATION (15.734 kHz)		
SLOW STILL			

Table 3-4-3 Main signal for drum servo

1. Speed control

The FG signal obtained from drum rotation is applied to the drum F-V (frequency to voltage) converter. The resulting speed error voltage is mixed with phase error voltage and supplied to the drum motor drive amplifier.

2. Phase control (REC mode)

The reference signal during recording is the vertical sync component of the video signal. This is counted down 1/2 and resets the drum reference counter.

The comparison signal is taken from the drum flipflop. The drum trapezoid counter starts at the falling edge of the drum flipflop signal. Trapezoid counter data are sampled at 17.42 ms from the reference counter reset point. The sampled data are pulse width modulated (PWM) and smoothed to become a DC voltage.

This phase error voltage is mixed with the speed error voltage and supplied to the drum MDA. When the drum phase servo is locked, the sampling position is at the center of the trapezoid incline. The drum flipflop, i.e., head switching point, is positioned 6.014 H ahead of the V sync signal in consideration of the V sync separator delay amount.

$$16.68334\ \text{ms} + \frac{2.288\ \text{ms}}{2} - 25.1\ \mu\text{s} - 17.42\ \text{ms}$$

$$= 382.2\ \mu\text{s} = 6.014\ \text{H}$$

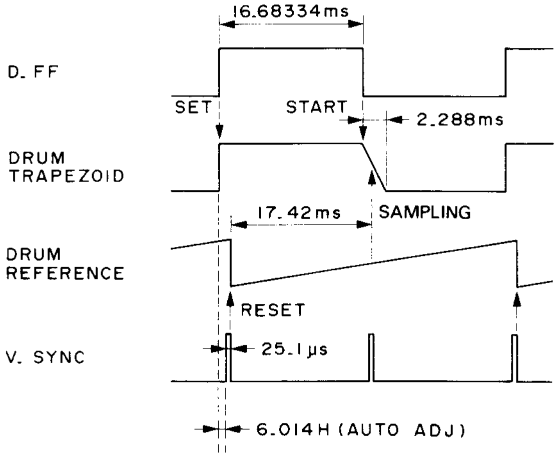


Fig. 3-4-5 Switching point for recording

3. Phase control (PB mode)

The reference signal during playback is taken from a crystal oscillator. The 3 fsc (10.74 MHz) is divided to 30 Hz and compared in phase with the drum flipflop. The drum flipflop phase is locked at 30 Hz and the drum turns at a fixed speed.

The phase relationship between the drum flipflop and playback V sync, i.e., switching point, is adjusted by varying the switching monostable multivibrator. The drum flipflop is synchronized with the falling edge of the multivibrator signal. The drum phase servo is able to track the changed switching point.

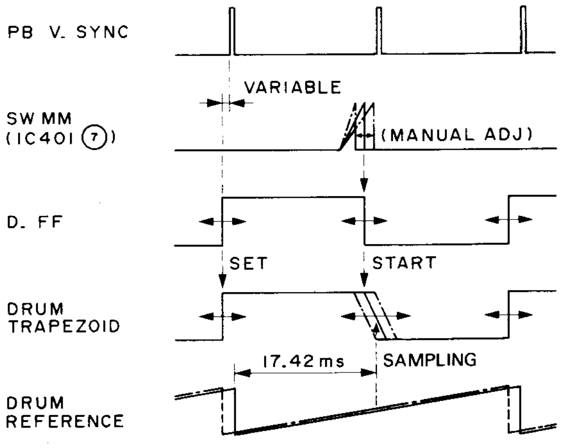


Fig. 3-4-6 Switching point for playback

3.4.6 Capstan servo

In the recording mode, the capstan servo reference is the input crystal clock (3 fsc), while the capstan FG produces the comparison signal. These are used to control the capstan motor rotation.

During playback, the input clock signal (3 fsc) is the reference and the playback control pulse is the comparison signal. Capstan motor rotation is controlled to obtain the same phase relationship between the drum flipflop and control pulse as in recording. This ensures the channel 1 and 2 heads trace their correct tracks.

Mode	Phase Servo		Speed Servo
	Reference Signal	Comparison Signal	
REC	X'TAL 30 H	CAPSTAN FG 30 Hz	CAPSTAN FG SP: 1440 Hz LP: 720 Hz EP: 480 Hz
PB	X'TAL 30 Hz	PB CTL PULSE 30 Hz	
ASSEMBLY	X'TAL 30 Hz (V. sync reset)		
INSERT	X'TAL 30 Hz (V. sync reset)		
SEARCH	X'TAL 30 Hz (D.FF reset)		
SLOW STILL	No operation		

Table 3-4-4 Main signal for capstan servo

1. Speed control

The FG signal produced by capstan rotation is converted into a voltage corresponding to the frequency. This speed error voltage is mixed with the phase error voltage and supplied to the capstan MDA.

2. Phase control (REC mode)

The 3 fsc (10.74 MHz) crystal oscillator is divided to 30 Hz by the reference counter and compared with 30 Hz counted down from the capstan FG signal. The capstan trapezoid counter starts at the point 14.393 ms from the reference counter start. The trapezoid counter data are sampled at the falling edge of the FG signal.

The sampled data are pulse width modulated and smoothed to form a DC voltage. This phase error voltage is mixed with the speed error voltage and supplied to the capstan MDA.

When the capstan phase servo is locked, the trapezoidal waveform is sampled at the center of the slanted component. The comparison signal, counted down from the FG signal, becomes 30 Hz and the capstan motor turns at fixed speed.

The control signal is recorded in synchronization with the V sync component of the video signal. The drum reference counter produces a discharge pulse at 14.369 ms from the reset point. This is delayed by a monostable multivibrator with time determined by 16 bit serial data from the mechacon. The signal is delayed an additional 2.288 ms and supplied to the control head for recording.

3. Phase control (PB mode)

If the playback tape was recorded by the same machine, the control signal timing is the same as with the drum flipflop reference (see Fig. 3-4-7).

The capstan reference counter is reset at the falling edge of the digital delay monostable multivibrator, while the trapezoid counter starts at the falling edge of the reference counter. The positive component of the playback control pulse samples the trapezoid counter data. The data are pulse width modulated and smoothed to a DC voltage.

The resulting phase error voltage is mixed with the speed error voltage and supplied to the capstan MDA.

When the capstan phase servo is locked, sampling occurs at the center of the trapezoid slanted component. The PB control pulse timing equals that of recording and the recorded tracks are traced accurately.

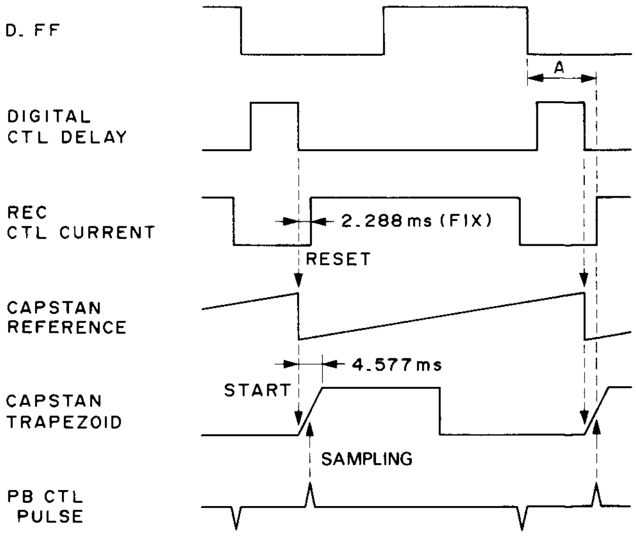


Fig. 3-4-7 PB capstan phase comparison (REC then PB)

If the playback tape was recorded by another set, differences in X value and control pulse timing lead to differences in the drum flipflop and control pulse phase (see Fig. 3-4-8).

The mechacon can adjust the end of count timing by changing the initial data of the reference counter, which is reset by the monostable multivibrator. This is set to where data for the maximum playback FM signal are detected (digital tracking). The data can also be adjusted manually.

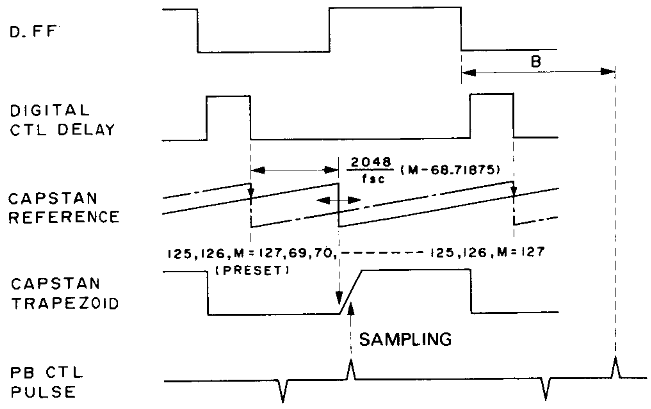


Fig. 3-4-8 Capstan phase comparison (another set)

3.4.7 Assembly editing

When the Pause button is pressed in the REC mode, the mechacon counts the capstan FG pulse. The tape rewinds for 1.4 seconds and the Pause mode is entered. By then pressing the Play button, the capstan phase servo functions to align the recorded control pulse of the tape with the vertical sync component of the input video signal. The REC mode resumes without picture disturbance at the editing point. For assembly editing, the drum phase servo must change from crystal lock to V. sync lock at the editing point. Phase difference must also be absent between these signals. The capstan phase servo functions from the control pulse during playback and the FG signal during recording.

Because of these relationships, the drum phase servo uses the V sync as reference for 1.3 seconds during playback and resets the drum reference counter. As this is the normal operation for recording, at the end of the playback interval, the drum phase servo remains locked at the switch from playback to recording.

The capstan phase servo is locked during the 1.3 second interval using the input video V sync component as reference and the PB control pulse as comparison. At the change from playback to recording, the capstan reference counter starts at the initial pulse rise of the counted down FG signal.

Afterwards, the reference counter operates at 30 Hz freerun. Even though the counter is no longer synchronized to the FG signal, since it free runs at 30 Hz, the capstan phase servo remains locked at the change to normal recording. Therefore, although the reference signal changes, the phase is not disturbed.

3.4.8 fh compensation

The normal playback drum rotation (30 Hz) in the Search mode would produce a change in relative tape to head speed. This introduces a video signal frequency change corresponding to the relative speed difference, resulting in an unstable picture. The relative speed also changes in the Slow and Still modes due to capstan motor accelerates and stops.

The drum phase comparator output voltage is therefore controlled in the Search, Slow and Still modes to maintain the playback horizontal sync at 15.734 kHz. Switch SW10 functions to increase the drum phase servo gain, while the drum reference counter is synchronized to the drum flipflop.

At the return to normal playback, SW9 switches on and the IC internal voltage (Vcc/2) charges an external capacitor. This serves to shorten the drum phase servo risetime when returning to normal playback.

3.4.9 Auto discriminator

1. Drum discriminator

SW11 switches on to set the drum phase servo to Vcc/2 in the following cases.

1) Drum speed declines more than 12% or increases more than 15.7%.
2) signal absence is detected during fh compensation.

2. Capstan discriminator

In the following situations, SW8 sets the capstan phase servo to Vcc/2.

1) Capstan speed declines below 9.2% or increases above 11.3%.
2) IC401 pin 19 is Low at Search start and stop, Slow or Still mode.
3) Playback control pulse is absent.

Connecting IC401 pin 19 to ground engages the capstan discriminator. This can be used for a service test.

3.4.10 F-V converter initialize

The F-V converter outputs go Low if the drum or capstan FG signal inputs do not appear at fixed intervals.

3.4.11 Switch operations

SW1: On during recording
SW2, SW3: On during playback
SW4: Selects control amplifier frequency response
Normal tape speed: on
Other tape speeds: off

SW5, SW6, SW7: Select capstan phase servo gain in Search, Slow and Still modes.

3.4.12 Vertical pulse

In Search, Slow and Still modes, FM noise occurs in the playback video signal due to the head and tape tracking relationship. The mechacon controls the capstan motor in order to position the noise outside the picture area.

As a result of this adjustment, the FM noise interferes with the video signal V sync component to produce vertical instability in the TV-monitor display. The vertical pulse is therefore inserted into the playback video signal to improve stability.

The servo IC produces the V pulse in synchronization with the playback H sync signal, while the drum flipflop is obtained from IC401 pin 48 as a window pulse. Refer to Fig. 3-4-9.

The V pulse has 3 values which mute the video signal. The 3 H period Mid-level is inserted into the video signal to function as V sync. Phase of the 3 H V pulse is adjusted by a monostable multivibrator. This varies the inserted V sync position and allows V lock adjustment. However, V lock is adjusted only at either the rising or falling edge of the drum flipflop. This differs according to head construction and mode.

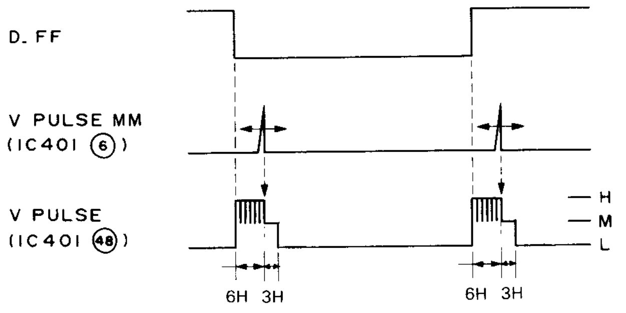


Fig. 3-4-9 V pulse timing chart

MODE	MODEL	T1	T2
SP	2 HEAD	FIX (6H)	Adj.
	DA4		
EP	2 HEAD	FIX (6H)	Adj.
	DA4	Adj.	FIX (6H)
LP	—	Output (Mid) FIX	

Table 3-4-5 V pulse timing in each mode

V PULSE	MUTE LEVEL
H	PEDESTAL
M	SYNC
L	THROUGH

Table 3-4-6 V pulse muting

3.4.13 YNR pulse

This pulse controls luminance noise reduction in the video circuit. The recursive noise reduction system uses positive feedback to improve the response of the line noise canceller (LNC) that utilizes horizontal correlation. Therefore, in order to avoid adverse effects from positive feedback in the V sync region, where correlation is weak, switching is needed between feedback and normal line noise canceller.

During normal recording and playback, the YNR pulse appears at servo IC pin 47. In the 20 H period between the drum flipflop falling and rising edges, the pulse is Low for switching to LNC.

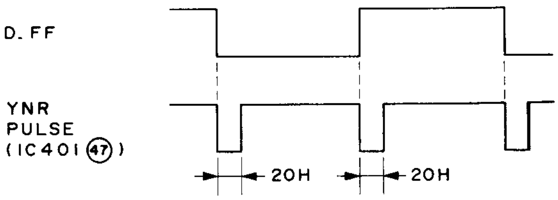


Fig. 3-4-10 YNR pulse timing

3.4.14 Auto tracking IC

1. Outline

This IC was developed specially for the auto tracking functions. Previously, two ICs were used (switching and opamp). Although the circuit principles are the same, these processes are now performed within the one IC.

The average FM signal (auto tracking detect data) output was previously the integrated (sawtooth) waveform indicated in Fig. 3-4-11. In the present IC, the internal sampling and hold circuit yields only the data maximum value output. The maximum DC level equals the integrated waveform peak. Since data fluctuation is eliminated, processing efficiency by the Mechacon CPU is improved.

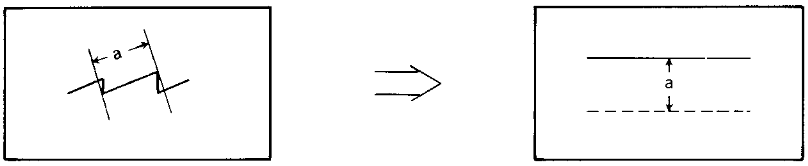
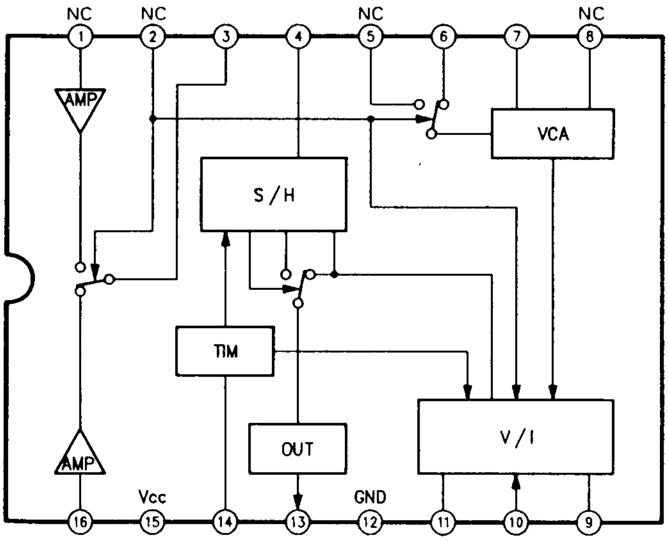


Fig. 3-4-11

2. IC block diagram



TIM : TIMING (Switching)
S/H : Sampling Hold
VCA : Voltage Control Adjust
V/I : Voltage/Current Converter

Fig. 3-4-12 IC451 Block diagram

3. Pin function

Pin No.	Note	Pin No.	Note
1	AUDIO FM IN	9	V/I RESISTOR
2	VFM/$\overline{\text{AFM}}$ CTL	10	$\overline{\text{SP}}$/EP GAIN CTL
3	AMP OUT	11	CHARGED CAPACITOR
4	HOLD CAPACITOR	12	GND
5	AUDIO FILTER IN	13	DC OUT
6	VIDEO FILTER IN	14	D F·F IN
7	VIDEO GAIN ADJ.	15	VCC
8	AUDIO GAIN ADJ.	16	VIDEO FM IN

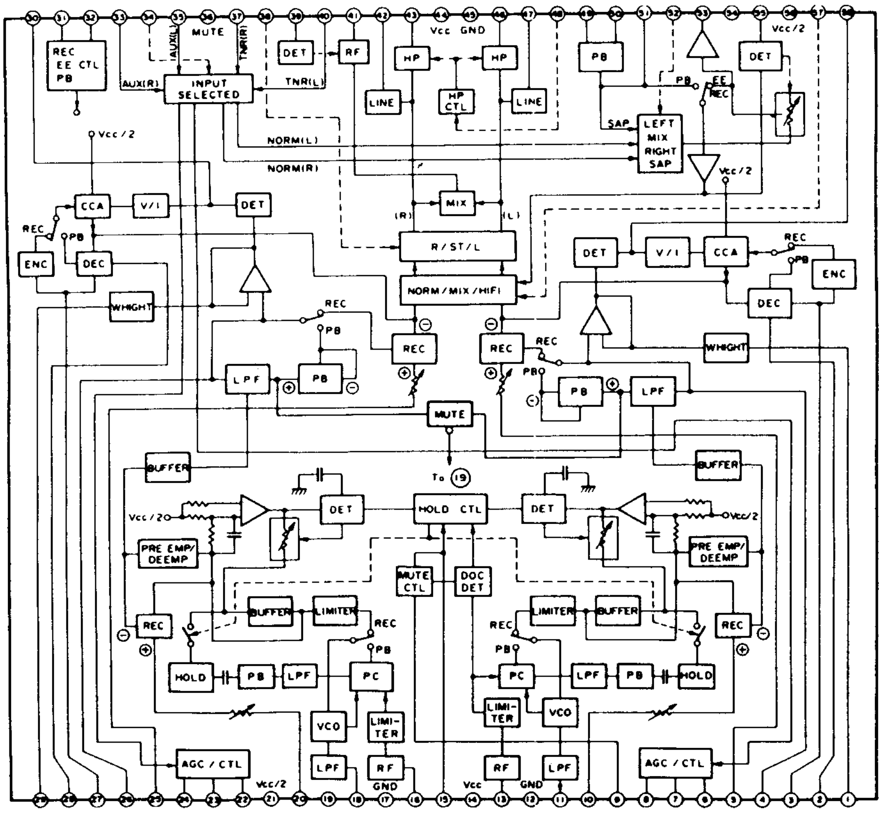
Table 3-4-7 IC451 pin function

3.5 AUDIO CIRCUIT

3.5.1 IC1 pin function

Pin No.	Function	Pin No.	Function
INPUT SIGNAL		CONTROL SIGNAL	
33,35	AUX (Lch), (Rch) (LINE IN)	9	DROP OUT CTL (FMA DET) NORM A ONLY: L
37,40	TNR (Rch), (Lch)	19	PB HiFi MUTE: L
13,16	PB FM	31	REC: L, EE: L, PB: H
OUTPUT SIGNAL		32	REC: L, EE: M, PB: H
		34	INPUT SELECT AUX: L SC: M, TU: H
11,18	REC FM	36	MUTE CTL (ON: L) PB: H/MUTE ON: L
42,47	LINE OUT (Rch), (Lch)	38	CH SEL Lch: H, STEREO: M, Rch: L
41	RF OUT	48	HEADPHONE LEVEL CTL (Min: 4 V, Max 11.5 V)
43,46	H. PHONE OUT (Rch), (Lch)	52	BIL/SAP CTL
		57	MON SEL HiFi: H, MIX: M, NORM: L

Table 3-5-1 IC1 main pins' function



REC
EE CTL
PB
MUTE
AUX(L)
TNR(R)
AUX(R)
INPUT SELECTED
TNR(L)
DET
RF
Vcc
GND
HP
HP CTL
LINE
PB
Vcc/2
EE
REC
SAP
LEFT MIX RIGHT SAP
NORM(L)
NORM(R)
MIX
(R)
(L)
R/ST/L
NORM/MIX/HIFI
CCA
V/I
ENC
DEC
WEIGHT
LPF
MUTE
To 19
BUFFER
HOLD CTL
PRE EMP/DEEMP
MUTE CTL
DOC DET
LIMITER
HOLD
PC
VCO
LIMI-TER
AGC/CTL
GND

Fig. 3-5-1 IC1 block diagram

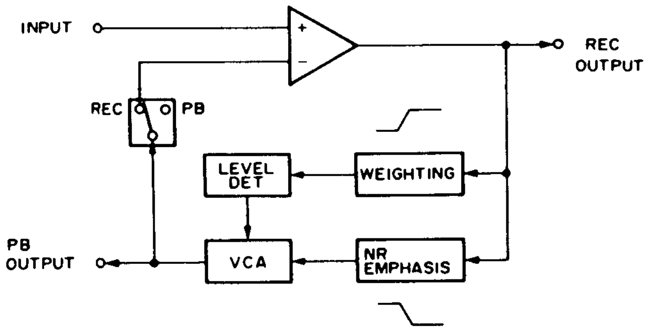


Fig. 3-5-2 VHS Hi-Fi noise reduction block

2. Pre-emphasis

The purpose of the pre-emphasis circuit is to maintain S/N at high frequencies. In FM systems, demodulation noise increases linearly as the frequency increases. During playback, S/N can be improved by reducing the gain of only the pre-emphasized component. The pre-emphasis time constant is set for 56 μs.

3. Input Limiter

The FM audio signal frequency band expands with increased input signal level. In order to prevent affecting the video signal, the input signal is limited to a fixed maximum.

4. Frequency Modulator

The frequency produced by the frequency modulator varies linearly with the input signal level. Center carrier frequencies are 1.3 MHz ± 10 kHz for the Left (Main) channel and 1.7 MHz ± 10 kHz for the Right (Sub) channel. Frequency deviation is ±50 kHz, with maximum set at ±150 kHz.

5. Lowpass Filter (LPF)

The FM signal from the modulator has a nearly square waveform and includes harmonics which would interfere with the video signal if recorded. The LPF yields a nearly sine waveform that eliminates these harmonics.

3.5.2 FM audio circuit playback system

1. Preamplifiers, Channel Switcher and FM AGC

The playback signals from the rotary audio heads are sent through the rotary transformers, then preamplified approximately 60 dB and supplied to the channel switcher. This uses the drum flipflop signal to produce continuous signals. The FM AGC circuit serves to compensate for level fluctuations due to variations in head to tape contact.

2. Band Pass Filter (BPF) (BPF1, 2)

The left channel BPF passes the 1.3 MHz ± 150 kHz FM signal and the right left channel BPF passes the 1.7 MHz ± 150 kHz FM signal.

3. Playback Limiter, Frequency Demodulator and LPF

The playback limiter removes AM components from the playback FM signal. Phase locked loop (PLL) demodulation is performed using the same demodulator circuit (VCO) used in recording. The LPF removes FM carrier components from the demodulated audio signal.

4. Switching Noise Reduction

1) Head switching noise

When the FM audio signals are recorded and played back by the rotary audio heads, pulse type noise is generated by the head switching process. Also, carrier phase disturbance occurs in the overlap portion due to slight differences in tape tension and other factors between recording and playback.

As indicated in Fig. 3-5-3, the instantaneous phase of the carrier changes at the head switching point. This results in a frequency deviation change that appears as pulse type noise in the demodulated signal.

In the case of the video signal, head switching is performed outside the picture region. However, since blanking is absent from the audio signal, processing is required in order to remove the noise.

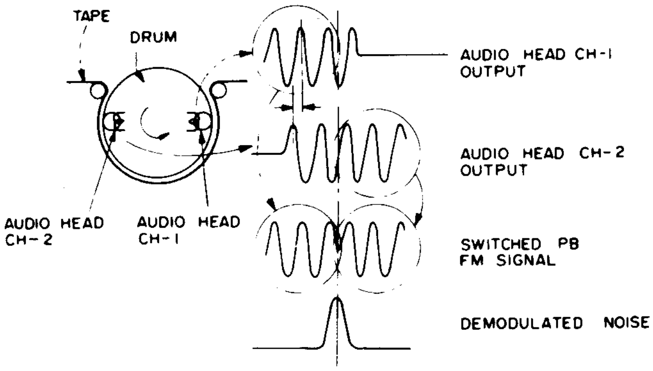


Fig. 3-5-3 Head switching noise

2) Pre-hold method

This technique uses a sampling and hold circuit as shown in Fig. 3-5-4. Demodulated audio signal (a), which includes pulse noise, is sampled by hold pulse (b) produced from the head switching signal. The result is held to prevent transfer of the noise to the following stage.

The width of hold pulse (b) is generally set for about 20 μs in order to adequately cover the pulse noise which has been affected by the bandpass filter for the FM signal and the lowpass filter for cutting high frequency noise after demodulation.

This method is comparatively simple and effective at removing pulse noise. However, it does not perform well at high frequencies.

Interpolation error is indicated in waveform (c) of Fig. 3-5-4. Even though operation is nearly ideal at no signal and at low frequency, additional error is produced with respect to high frequency and high slew rate signals.

In actual music signals, high frequencies tend to possess lower level than midrange. The music also tends to mask the noise produced by interpolation error to where it is not easily detected. However, in the case of sounds approaching a mono-frequency, the noise cannot be ignored.

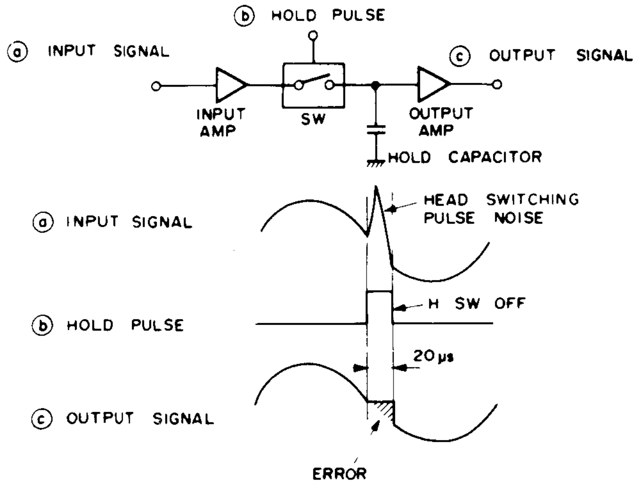

ⓑ HOLD PULSE
ⓐ INPUT SIGNAL
ⓒ OUTPUT SIGNAL
INPUT AMP
SW
OUTPUT AMP
HOLD CAPACITOR
ⓐ INPUT SIGNAL
HEAD SWITCHING PULSE NOISE
ⓑ HOLD PULSE
H SW OFF
20μs
ⓒ OUTPUT SIGNAL
ERROR

Fig. 3-5-4 Pre-hold method

3) Reduced interpolation time

There are two techniques for improving the performance of the pre-hold method. One of these is to shorten the interpolation time.

This consists of designing for appropriate response in the bandpass filter for the FM signal and lowpass filter for the demodulated signal. If the pulse noise is prevented from widening, the minimum required hold pulse can be used.

By this relatively modest improvement, interpolation time can be reduced to less than half and interpolation error reduced considerably.

4) Closed loop interpolation (CLI)

In addition to shortening the interpolation time, this technique can further reduce interpolation error. This principle is illustrated in Fig. 3-5-5.

The slope just prior to the noise component is detected and the holding capacitor is discharged accordingly. The slope data are applied to a loop for performing interpolation.

Compared with the pre-hold method, this system offers greater interpolation error suppression without regard to frequency.

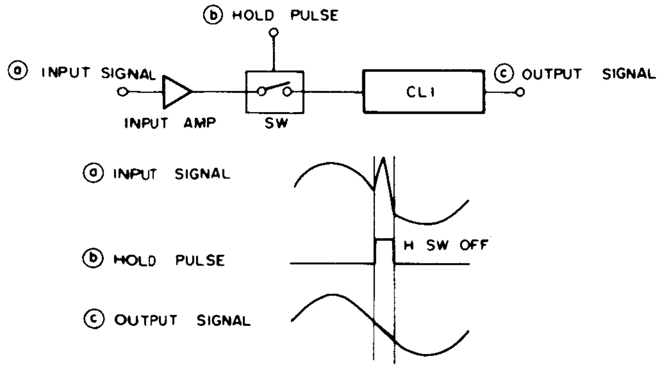

ⓑ HOLD PULSE
ⓐ INPUT SIGNAL
ⓒ OUTPUT SIGNAL
INPUT AMP
SW
CLI
ⓐ INPUT SIGNAL
ⓑ HOLD PULSE
H SW OFF
ⓒ OUTPUT SIGNAL

Fig. 3-5-5 Closed loop interpolation

5) Adaptive closed loop interpolation (ACLI)

This is a further development of the CLI method which offers reduction for a wider range of noise. The principle is illustrated in Fig. 3-4-6.

The slew rate is detected for controlling the interpolation time for the optimum value. Since interpolation error is not large for a low slew rate signal, a longer time is desired in order to cover the switching noise ringing component. However, a shorter interpolation time provides better overall noise reduction for a high slew rate signal.

Fig. 3-5-7 illustrates the noise spectrum for 15 kHz recording and playback. The pre-hold method is shown by waveform A, CLI by B and ACLI by C.

In the case of C, switching noise is eliminated and system noise (tape noise, etc.) becomes dominant in the waveform.

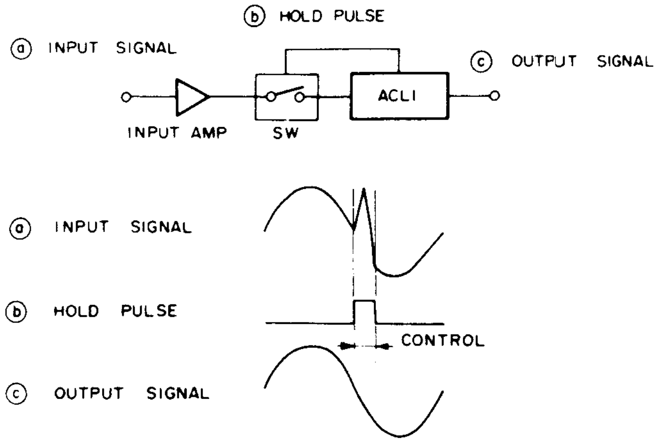

ⓑ HOLD PULSE
ⓐ INPUT SIGNAL
ⓒ OUTPUT SIGNAL
ACLI
INPUT AMP
SW
ⓐ INPUT SIGNAL
ⓑ HOLD PULSE
CONTROL
ⓒ OUTPUT SIGNAL

Fig. 3-5-6 Adaptive closed loop interpolation

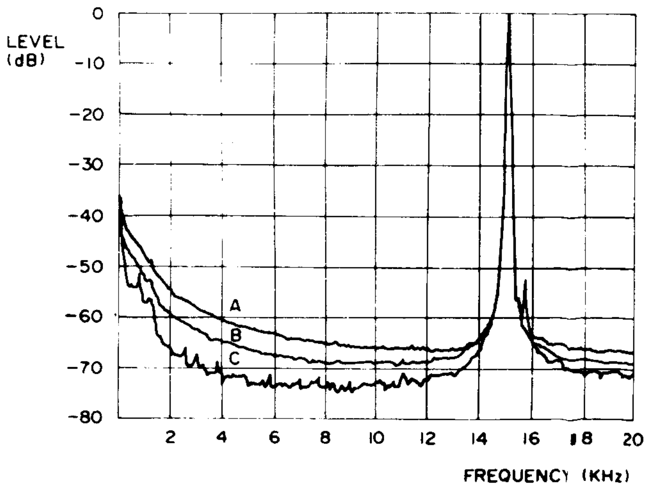


Fig. 3-5-7 Noise spectrum

6) Advanced New Tangent System

The advanced new tangent system is the improved version of the previous new tangent system, and correction can be made for both Lch and Rch.

See Fig. 3-5-8

In the new tangent system, correction is performed by averaging the value of the correction period of the switching noise of Lch and Rch. In this case, the noise of Lch is larger than the noise of Rch, when the signals of Lch and Rch are different. The reverse is also true.

In the advanced new tangent system, correction operation is properly controlled according to the through rate of each channel. This improves the noise component due to the switching noise.

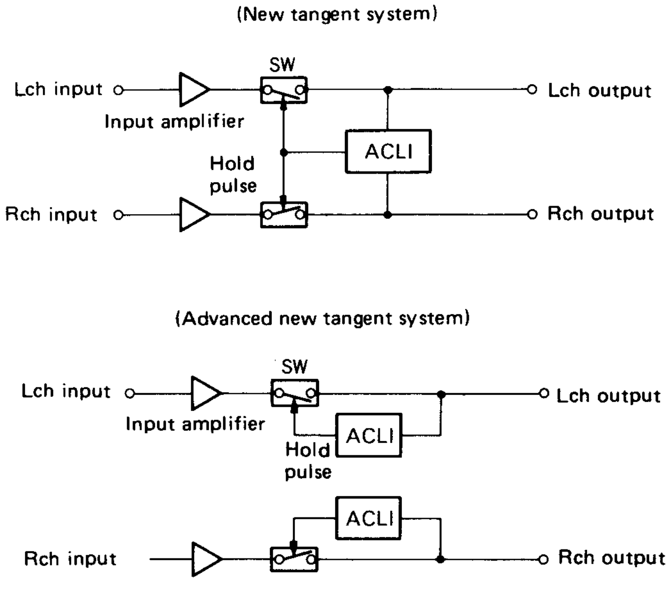

(New tangent system)
SW
Lch input
Lch output
Input amplifier
ACLI
Hold
pulse
Rch input
Rch output
(Advanced new tangent system)
SW
Lch input
Lch output
Input amplifier
ACLI
Hold
pulse
ACLI
Rch input
Rch output

Fig. 3-5-8

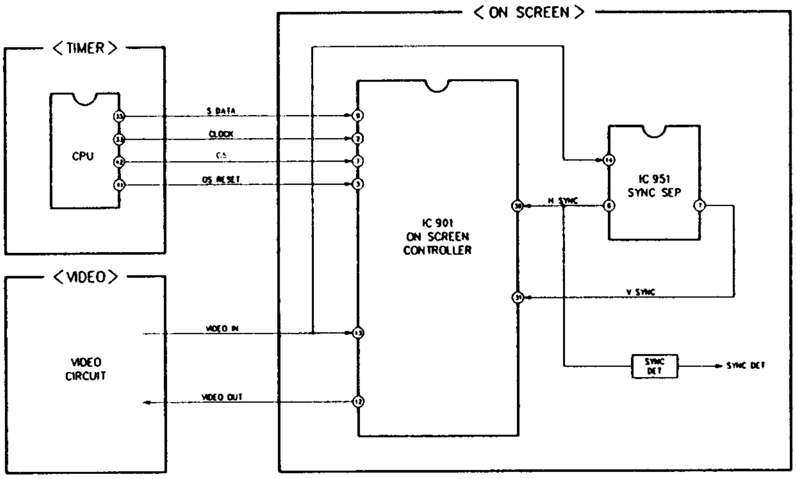
3.6 ON SCREEN CIRCUIT

3.6.1 Outline

The on-screen circuit is comprised of IC901 and IC951. The circuit functions to superimpose character data onto the video signal from the video circuit. When on-screen data are not displayed, the video signal passes through the circuit directly.

All on-screen functions are controlled by the timer CPU. The control data are supplied as 8-bit serial code to IC901. This IC performs nearly all the processing needed for superimposing the characters in accordance with the control data.

However, external sync is required and this is obtained from IC951, which separates the sync from the video signal.

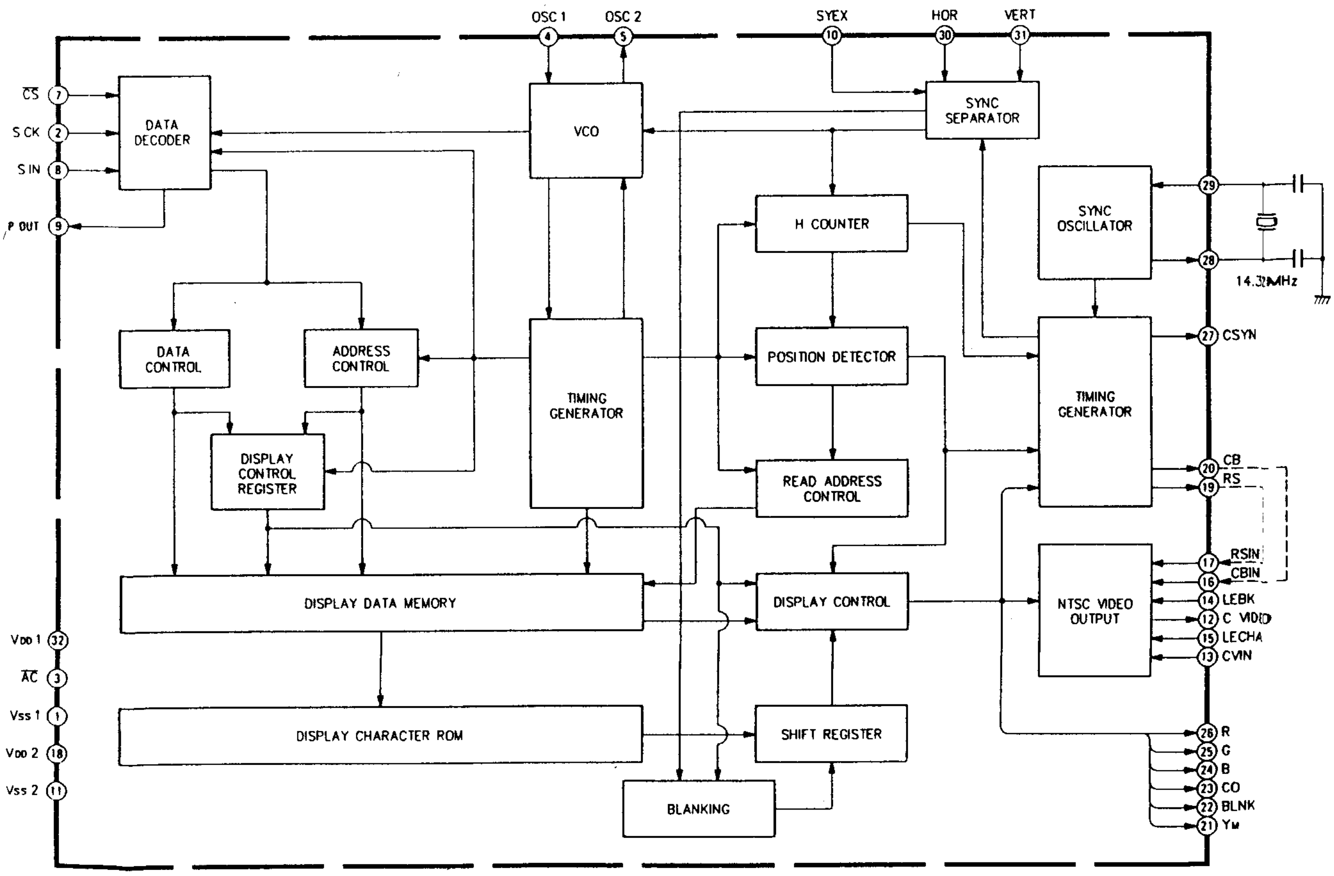


< ON SCREEN >
< TIMER >
CPU
33
34
42
41
S DATA
CLOCK
CS
OS RESET
8
2
7
3
IC 901
ON SCREEN
CONTROLLER
IC 951
SYNC SEP
14
6
7
H SYNC
30
V SYNC
31
< VIDEO >
VIDEO
CIRCUIT
VIDEO IN
13
VIDEO OUT
12
SYNC
DET
SYNC DET

Fig. 3-6-1 ON SCREEN CPU SYSTEM

The main functions of these ICs are as follows.

3.6.2 IC901 Block diagram



OSC 1
OSC 2
4
5
SYEX
HOR
VERT
10
30
31
$\overline{CS}$ 7
S CK 2
S IN 8
P OUT 9
DATA
DECODER
VCO
SYNC
SEPARATOR
H COUNTER
SYNC
OSCILLATOR
29
28
14.32MHz
DATA
CONTROL
ADDRESS
CONTROL
TIMING
GENERATOR
POSITION DETECTOR
TIMING
GENERATOR
27 CSYN
DISPLAY
CONTROL
REGISTER
READ ADDRESS
CONTROL
20 CB
19 RS
17 RSIN
16 CBIN
DISPLAY DATA MEMORY
DISPLAY CONTROL
NTSC VIDEO
OUTPUT
14 LEBK
12 C VIDO
15 LECHA
13 CVIN
VDD 1 32
$\overline{AC}$ 3
Vss 1 1
VDD 2 18
Vss 2 11
DISPLAY CHARACTER ROM
SHIFT REGISTER
BLANKING
26 R
25 G
24 B
23 CO
22 BLNK
21 YM

Fig. 3-6-2 IC901 Block diagrams

3.6.3 IC901

Type	:	M50554-168SP
Functions	:	On-screen controller Built-in character generator (ROM/RAM) Simple video signal generator (blue background) Built-in sync signal generator Indication position control

3.6.4 Pin function (IC901)

Symbol No.	Label	Contents
1	Ground	Digital system ground connection.
2	Serial Clock input	With CS "L", serial data SIN input at SCK rise. Hysteresis input. Built-in pull-up resistor.
3	Auto Clear input	IC internal reset at "L". Built-in pull-up resistor. Hysteresis input.
4 5	External Oscillator connections	Approx. 7 MHz. Frequency determines TV Picture horizontal display position and character width.
6	NC	NC
7	Chip select input	Serial data transfer at "L". Built-in pull-up resistor.
8	Serial data input	Data and address serial input for display control register and display data. Built-in pull-up resistor.
9,10	NC	NC
11	Ground	Analog system ground.
12	Composite video output	2 Vp-p. In superimpose mode, characters, etc. are superimposed on CVIN.
13	Composite video input	In superimpose mode, characters, etc. are superimposed on this signal.
14	Blanking level	Input determines video signal blanking level.
15	Character level	Input determines character output level within video signal. Characters are white.
16	Color burst	Input for external CB circuit. This is converted to the video signal color burst signal level.
17	Character background carrier	Input for external CB circuit. This is converted to the video signal color carrier signal level.
18	Power supply	+5 V is connected for analog system.
19	Character background carrier	Carrier signal output for character background color. Phase relative to color burst signal CB. 5 V amplitude.
20	Color burst signal output	NTSC: 3.58 MHz PAL: 4.43 MHz Amplitude: 5 V
21 ~ 27	NC	NC
28 29	Sync Oscillator	External oscillator connection for sync Signal generator. NTSC: 14.32 MHz PAL: 17.73 MHz
30	Horizontal sync	Input for horizontal sync signal. Hysteresis input. Polarity selectable when determining character ROM.
31	Vertical sync	Input for vertical sync signal. Hysteresis input. Polarity selectable when determining character ROM.
32	Power supply	+5 V is connected for digital system.

Table 3-6-1 Pin functions

3.6.5 IC951

Type	: M52684AP
Functions	: Sync signal separator Horizontal AFC Horizontal oscillator (32 fH)

3.6.6 IC951 Block diagram

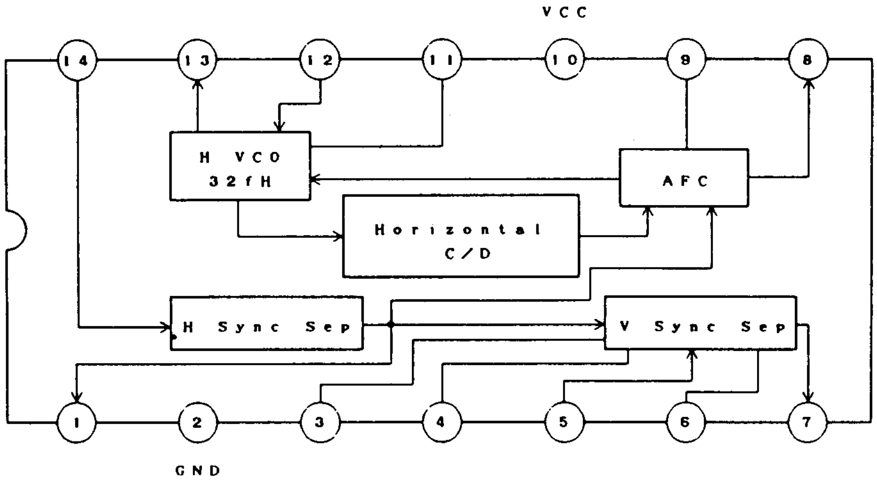


Fig. 3-6-3 IC951 Block diagram

Pin No.	Label	I/O	Contents
1	S-OUT	O	Separated Horizontal sync signal output
2	GND	I	GND
3 4	VR1 VR1	I	Vertical sync signal separation reference (1)
5	VR2	I	Vertical sync signal separation reference (2)
6	VF	I	Vertical sync signal separation filter
7	$\overline{\text{VD}}$	O	Separated Vertical sync signal output
8	$\overline{\text{H}}$	O	Separated Horizontal sync signal output (AFC out)
9	AFC	I	AFC filter
10	Vcc	I	5 V
11	OSC3	I	Oscillator connection
12 13	OSC2 OSC1	I O	External oscillator connections for 32 fH VCO
14	S-SEP	I	Composite sync signal input

Fig. 3-6-4 IC951 pin functions

3.7 TUNER CIRCUIT

3.7.1 PLL data

The Mechacon CPU supplies 18 bit serial data and clock signals to tuner. The 18 bits consist of 4 bits band selection data and 14 bits for the programmable divider ratio.

The first 9 bits of the programmable divider data set the main counter dividing ratio (M), while the remaining 5 bits set the swallow counter ratio (S). The data enter the shift register at the clock rising edge.

If the data are "H" at the clock falling edge, the shift register data are sent to the latch circuit. The latched data are then supplied to the counters and driver.

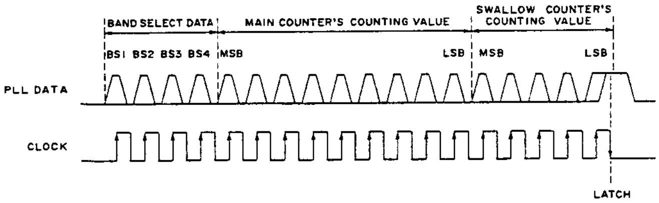

BAND SELECT DATA
MAIN COUNTER'S COUNTING VALUE
SWALLOW COUNTER'S COUNTING VALUE
BS1 BS2 BS3 BS4
MSB
LSB
MSB
LSB
PLL DATA
CLOCK
LATCH

Fig. 3-7-1 PLL data timing chart

3.7.2 IF circuit

1. SAW (Surface Acoustic Wave) filter

When the AM signal is transferred, phase delay occurs in the picture carrier. Delay also occurs in the envelope, i.e., video signal. Although the picture carrier is delayed by a fixed amount, the video signal delay time is determined by the frequency. This leads to differences in delay between the luminance and color components, preventing precise overlap of the signals in the the viewed picture. The SAW filter compensates by using ultrasonic wave differences to align the delay times in the video signal.

2. IF amplifier

This circuit amplifies the IF signal from the tuner control circuit to the level required by the video detector.

3. Video detector

The video detector uses the IF frequency obtained from a voltage controlled oscillator (VCO) to separate the carrier component from the IF signal. The envelope is comprised of mixed video and 4.5 MHz FM audio signals.

A phase locked loop (PLL) circuit compensates for phase difference between the VCO output and the IF signal. The VCO output is locked at 45 degrees advanced phase from the IF signal.

4. 4.5 MHz trap

This removes the 4.5 MHz FM audio component from the video detector output.

5. Black noise clamp (BNC)

Clamps black level pulse noise that exceeds the sync signal level.

6. Sound IF detector

The audio IF signal is sampled by SAW2. This is down converted with the IF frequency from the VCO to yield the 4.5 MHz FM audio signal.

7. 4.5 MHz bandpass filter

passes only the baseband audio signal.

8. Sound detector

Demodulates the 4.5 MHz baseband audio signal.

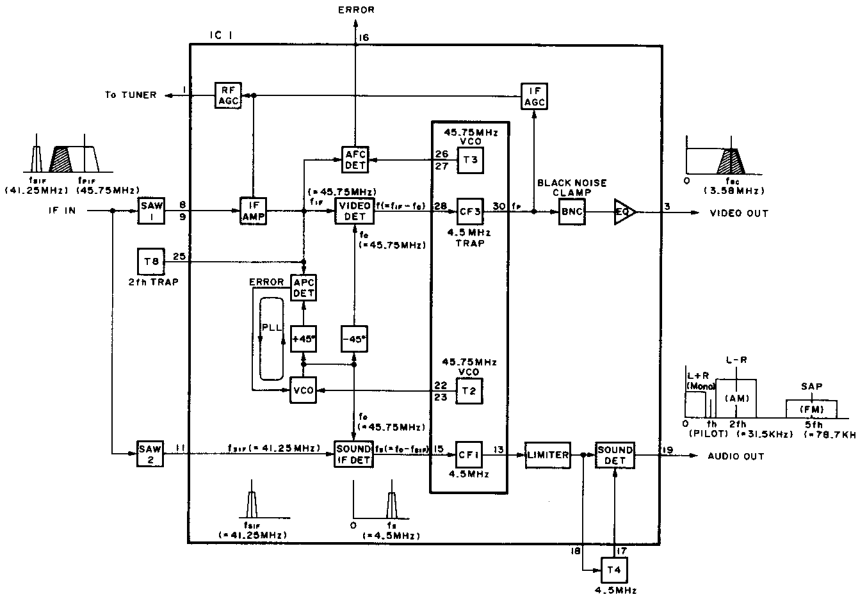

ERROR
16
IC 1
To TUNER
1
RF AGC
IF AGC
fSIF (41.25MHz)
fPIF (45.75MHz)
IF IN
SAW 1
8
9
IF AMP
(≈45.75MHz) fIF
AFC DET
VIDEO DET
f(=fIF−fO)
fO (≈45.75MHz)
45.75MHz VCO
26
27
T3
28
CF3
30
fP
4.5MHz TRAP
BLACK NOISE CLAMP
BNC
EQ
3
VIDEO OUT
0
fSC (3.58MHz)
T8
25
2fh TRAP
ERROR
APC DET
PLL
+45°
−45°
VCO
45.75MHz VCO
22
23
T2
fO (≈45.75MHz)
SAW 2
11
fSIF (= 41.25MHz)
SOUND IF DET
fS(=fO−fSIF)
15
CF1
13
4.5MHz
LIMITER
SOUND DET
19
AUDIO OUT
L+R (Mono)
L−R (AM)
SAP (FM)
0 fh 2fh 5fh
(PILOT) (≈31.5KHz) (≈78.7KHz)
fSIF (≈41.25MHz)
0 fS (≈4.5MHz)
18
17
T4
4.5MHz

Fig. 3-7-2 IF block diagram

3.7.3 Demodulator circuit

1. Stereo lowpass filter

Removes the 2nd audio signal and passes the main and sub audio signals.

2. L + R lowpass filter

Removes the sub and passes the main audio signal.

3. 75 µs de-enhancer

Removes the 75µs enhancement applied to the main audio signal by the broadcast station.

4. Pilot detector and stereo LED driver

Detects the pilot signal of a stereo broadcast. When the pilot signal is present, the Stereo LED lights.

5. L − R detector and 2 fh VCO

VCO frequency (2 fh) is used for removing the 2 fh carrier component from the AM sub audio signal (L − R).

A PLL circuit compensates for phase difference between the 2 fh VCO output and the pilot signal (fh).

6. L − R lowpass filter

Passes the demodulated sub audio signal.

7. dbx-TV expander

The dbx-TV companding system used by the broadcast station logarithmically compresses the sub audio signal. This circuit reverses the compression.

8. Matrix circuit

Uses L + R and L − R signals to derive L, R, and L + R signals.

9. SAP bandpass filter

Yields only the 2nd audio signal.

10. SAP demodulator

Demodulates the 5 fh FM 2nd audio signal.

11. SAP detector and SAP LED driver

Smooths noise components of the 2nd audio signal and in the 11.5 fh area. These DC levels are compared for detecting presence of the 2 nd audio signal. When present, the SAP LED lights.

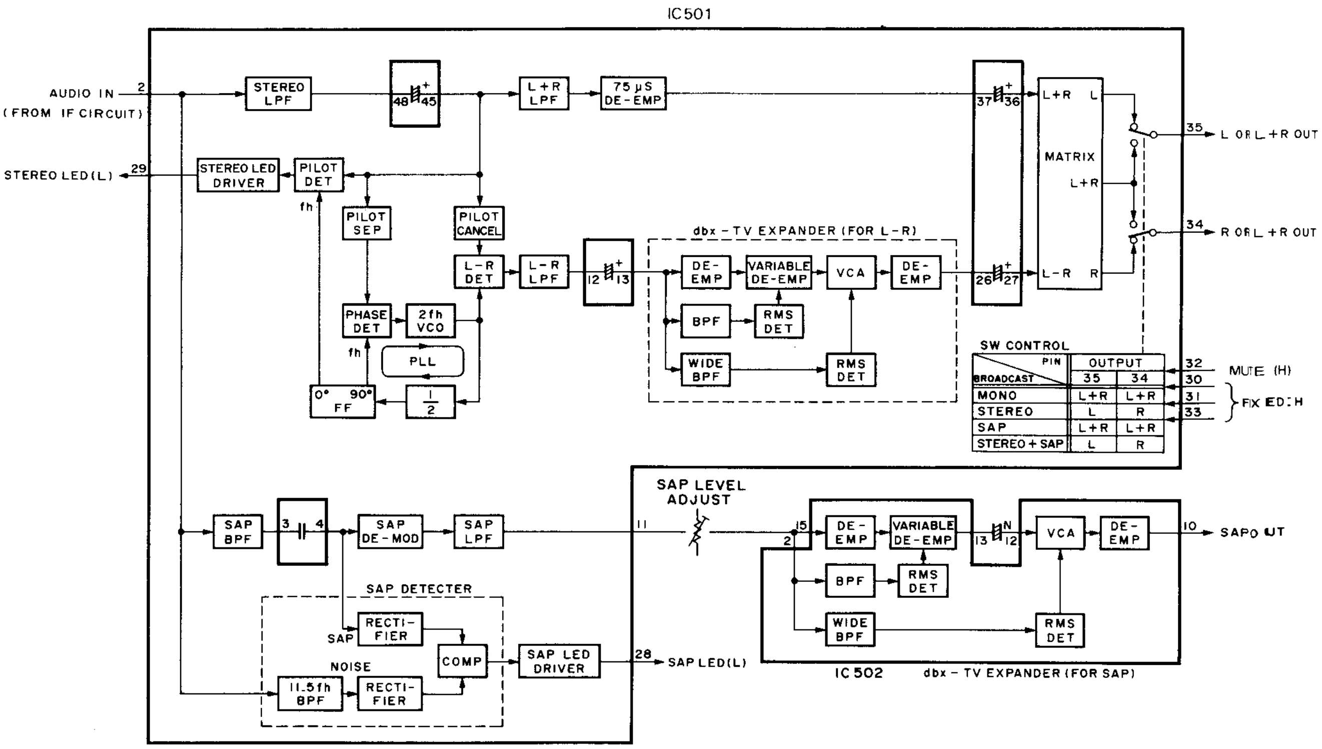

IC501
AUDIO IN (FROM IF CIRCUIT)
2
STEREO LED(L)
29
STEREO LPF
48
45
L+R LPF
75 µS DE-EMP
STEREO LED DRIVER
PILOT DET
fh
PILOT SEP
PILOT CANCEL
L−R DET
L−R LPF
12
13
PHASE DET
2fh VCO
PLL
0° 90° FF
1/2
dbx−TV EXPANDER (FOR L−R)
DE-EMP
VARIABLE DE-EMP
VCA
DE-EMP
BPF
RMS DET
WIDE BPF
RMS DET
37
36
26
27
L+R
L
MATRIX
L+R
L−R
R
35
L OR L+R OUT
34
R OR L+R OUT
SW CONTROL
PIN
BROADCAST
OUTPUT
35
34
MONO L+R L+R
STEREO L R
SAP L+R L+R
STEREO+SAP L R
32
MUTE (H)
30
31
33
FIXED:H
SAP BPF
3
4
SAP DE-MOD
SAP LPF
11
SAP LEVEL ADJUST
SAP DETECTER
SAP
RECTI-FIER
NOISE
11.5fh BPF
RECTI-FIER
COMP
SAP LED DRIVER
28
SAP LED(L)
15
2
DE-EMP
VARIABLE DE-EMP
13
N
12
VCA
DE-EMP
BPF
RMS DET
WIDE BPF
RMS DET
10
SAP OUT
IC 502
dbx − TV EXPANDER (FOR SAP)

Fig. 3-7-3 Demodulator block diagram

3.8 PRE/REC CIRCUIT

3.8.1 IC201 pin function

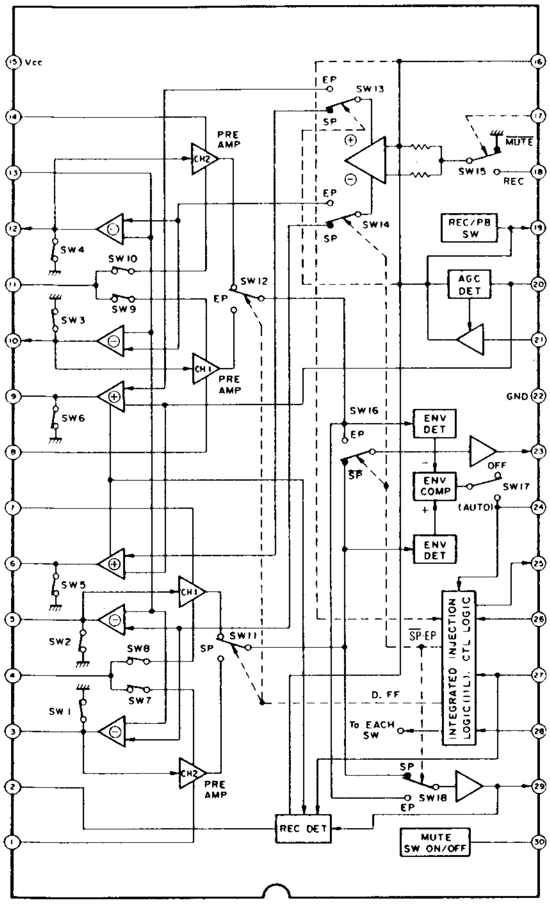

Vcc
PRE AMP
CH2
CH1
SW13
SW14
SW15
MUTE
REC
EP
SP
REC/PB SW
AGC DET
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SW11
SW12
SW16
SW17
SW18
ENV DET
ENV COMP
OFF
(AUTO)
GND
INTEGRATED INJECTION LOGIC (I²L) CTL LOGIC
SP·EP
D. FF
To EACH SW
REC DET
MUTE SW ON/OFF
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩
⑪
⑫
⑬
⑭
⑮
⑯
⑰
⑱
⑲
⑳
㉑
㉒
㉓
㉔
㉕
㉖
㉗
㉘
㉙
㉚

Fig. 3-8-1 IC201 Block diagram

Pin No.	Contents
1	SP CH2 dubbing adjustment
2	REC AGC detector
3	PB SP CH2 signal input/REC SP (−) output
4	GND
5	PB SP CH1 signal input/REC SP (−) output
6	PB SP common
7	SP CH1 dubbing adjustment
8	EP CH1 dubbing adjustment
9	PB EP common
10	PB EP CH1 signal input/REC EP (−) output
11	GND
12	PB EP CH2 signal input/REC EP (−) output
13	REC (−) amplifier DC feedback
14	EP CH2 dubbing adjustment
15	Vcc
16	REC EQ/Slow SW
17	Icc adjustment
18	REC signal input
19	AGC output/REC, PB SW
20	AGC detector/REC (+) amplifier DC feedback
21	AGC input
22	GND
23	PB signal output
24	SP/EP SW
25	Color rotation signal output
26	Drum FF signal input
27	Sync signal input
28	PB control input (MANUAL: H, AUTO: M, SLOW/STILL, L)
29	Envelope output/REC AGC adjustment
30	MUTE SW

Table 3-8-1 IC201 pin functions

LOGIC INPUT				SWITCHING OPERATION (INSIDE IC)							OUTPUT	
㉘	㉔	㉖	⑯	SW1, 2	SW3, 4	SW11	SW12	SW16,18	SW17	SW13,14	㉓ ㉙	㉕
PB CONTROL	SP/EP SW	DRUM FF	SLOW SW	SP INPUT SW	EP INPUT SW	SP HEAD SELECT	EP HEAD SELECT	OUTPUT SELECT	ENV COMP SW	INPUT SELECT	REC AMP OUTPUT	COL ROT OUTPUT
H (MANUAL)	H (EP)	H	OPEN	ON	OFF	DRUM FF H: CH2 L: CH1 (SP)	DRUM FF H: CH2 L: CH1 (EP)	EP	OFF	EP	EP CH2	L
		L									EP CH1	H
	L (SP)	H		OFF	ON			SP		SP	SP CH2	H
		L									SP CH1	L
M (AUTO)	ENV COMP OUT H	H			OFF			EP	AUTO	EP	EP CH2	L
		L									EP CH1	H
	ENV COMP OUT L	H						SP			SP CH2	H
		L									SP CH1	L
L (STILL)	H	H						EP	OFF		EP CH2	L
		L						SP			SP CH1	L
	L	H						SP			SP CH2	H
		L						EP			EP CH1	H
L (SLOW)	H	H	L					EP			EP CH2	L
		L									EP CH1	H
	L	H						SP			SP CH2	H
		L									SP CH1	L

(SW5, SW6, SW7, SW8, SW9, SW10) PB: ON

Table 3-8-2 IC201 Switching operation CPB mode

3.8.2 IC1 pin function

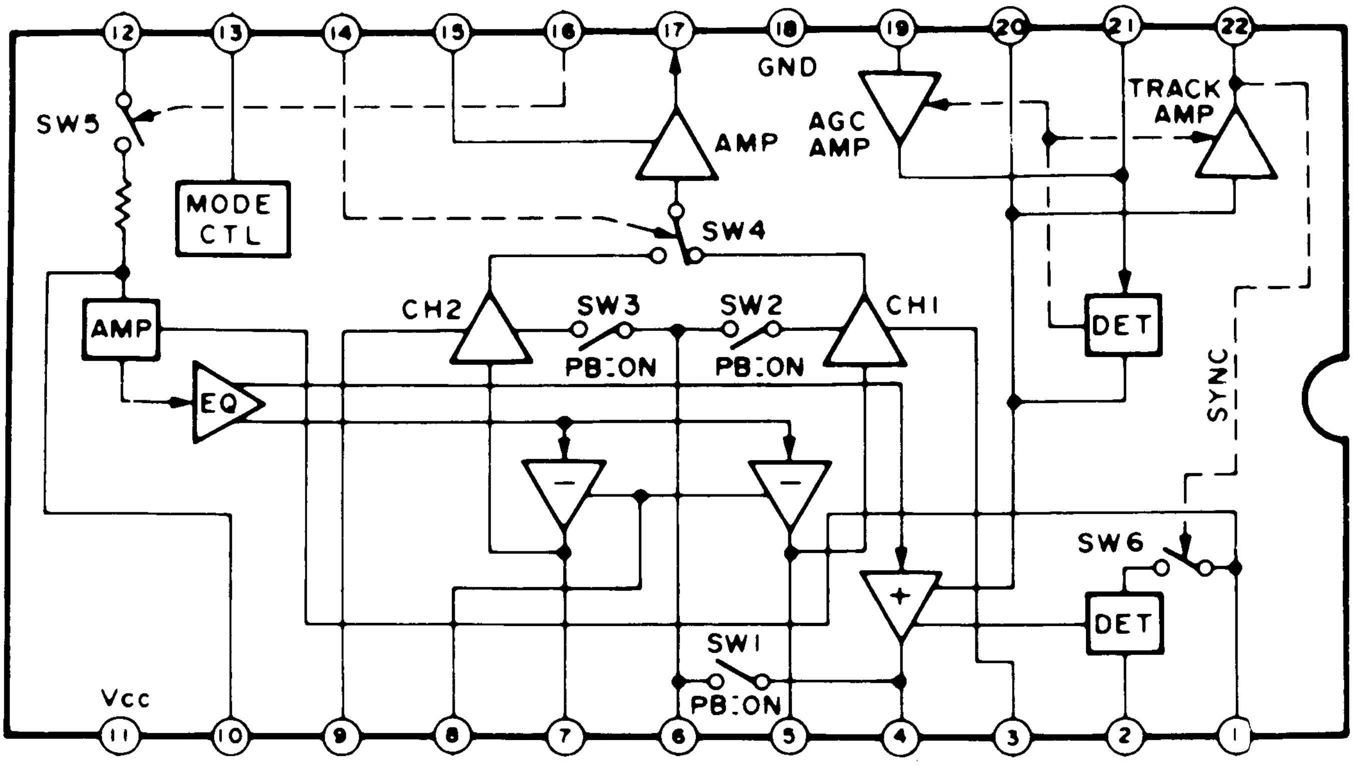

12
13
14
15
16
17
18
19
20
21
22
GND
SW5
AMP
AGC
AMP
TRACK
AMP
MODE
CTL
SW4
CH2
SW3
SW2
CH1
PB:ON
PB:ON
AMP
EQ
DET
SYNC
SW6
DET
SW1
PB:ON
Vcc
11
10
9
8
7
6
5
4
3
2
1

Fig. 3-8-2 IC1 Block diagram

Pin No.	Function
5	CH1 REC OUT/PB IN
7	CH2 REC OUT/PB IN
11	Vcc (5 V)
12	REC FM IN
13	HiFi REC START (Low)
14	AUDIO FF IN
15	SP (Low)
17	PB FM OUT
18	GND
19	PB AGC AMP IN
21	PB AGC AMP OUT

Table 3-8-3 IC1 main pins' function